The Journal of the International College of Surgeons

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OCTOBER, 1956

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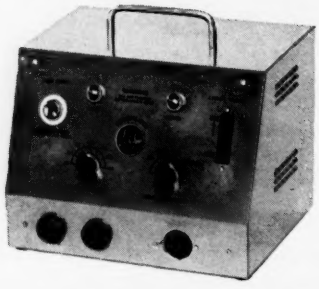

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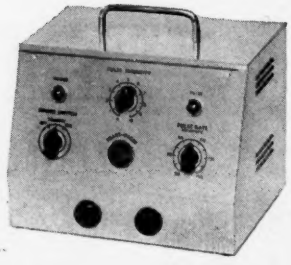

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General Surgery

Peptic Ulcer

Perforation and Hemorrhage; Choice of Operation

MOSES BEHREND, M.D., F.A.C.S., F.I.C.S.*

PHILADELPHIA, PENNSYLVANIA

PEPTIC ulcer, whether it attacks the duodenum or the stomach, has been a subject of controversy for the past fifty years or more. The causes, the method of treatment (medical or surgical) the type of operation that should be performed, and the question whether there shall be an operation at all have been subjects of discussion for a long time. In the first ten years of this century, controversial arguments as to whether peptic ulcers should be treated medically or surgically became so heated that the partisans made the walls of the hall tremble with their oratory. This has continued through the years with less fervor, however, because almost everyone concedes now that peptic ulcer should be given a fair chance with medical treatment. My own opinion is that too much time is wasted in the prolonged medical treatment of these ulcerations. The best results are obtained by early operation. One should not wait until scar tissue at the pylorus causes obstructive symptoms. Again, operation is a prophylactic measure against perforation and hemorrhage.

In 1930 I published a paper on gastric and duodenal ulcers and stated at the time that perforated ulcers usually do not bleed and bleeding ulcers do not perforate. This was a statement open to reservations,

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because one could not lay down hard and fast rules concerning any medical or surgical condition. There are exceptions, because some perforated ulcers have bled at the time of perforation, and, *vice versa,* some hemorrhagic ulcers have perforated. By and large, however, the protocol as stated before concerning perforated and hemorrhagic ulcers still holds.

Gastric and Duodenal Hemorrhage.—Hemorrhages from peptic ulcers always instill into the physician a certain amount of fear. Often there may be no previous history of ulcer. Hemorrhage may occur from many sources, such as the esophagus, the stomach, the duodenum, the large and small intestines or a cirrhotic liver. Treatment of hemorrhage from peptic ulcer has divided the profession into two camps—the conservative and the radical group. Welch, Allen and Donaldson recommend operating on bleeding ulcers after the first massive hemorrhage, because, in their opinion, bleeding recurs. This side of 40 years of age it may be reasonable to wait and treat the patient medically for a while, with transfusion, and perform the laboratory work that is indicated. If the patient is past 40 it is a little dangerous to wait, on account of arteriosclerosis of the blood vessels. In cases of repeated hemorrhage due to peptic ulcer at any age one should always operate. Several years ago it was impressed upon me how dangerous it is to wait, hoping that the ulcers will stop bleeding. One man over 40 and another patient under 40 were apparently safe at the time of afternoon hospital rounds. During the night, however, bleeding must have continued, for they were dead by the next morning. I have always been a radical when hemorrhage from the gastrointestinal tract is present. When the blood has been replaced, the sooner one operates upon the patient the better.

When operating upon patients with hematemesis and/or melena, one sometimes discovers lesions not related to peptic ulcer, which require operation to save the patient's life. A woman about 45 years old had hematemesis and bloody stools that could not be controlled. After the blood had been replaced, she was operated upon. The stomach and duodenum were perfect. It was necessary to examine the entire intestinal tract twice before I discovered the cause of bleeding—a small white pimple on the surface of the first portion of the jejunum. This was excised, and in the middle of the ulcer was a clot of blood. The patient made an uneventful recovery, and is living and in good health at the time of writing.

Acute gastritis may give rise to severe bleeding from the stomach as a result of many small, frequently invisible punctate ulcers. In such cases, the surface of the stomach bleeds almost throughout its entirety. Resection of the stomach has invariably stopped the bleeding and cured the patient.

Treatment of Perforated Ulcers Without Operation.—There are now many advocates of the nonoperative treatment of perforated peptic ulcer. Many active surgeons of large experience have inadvertently treated perforated ulcers by this method, perhaps because of a mistaken diagnosis. The greatest advocate in this country is Sam F. Seeley, M.D., who reported on 139 patients treated by the nonoperative method from October 1945 to December 1953. His results were very good. On one of the cruises of the International College of Surgeons, it was my privilege to make rounds with Dr. Iselin of Paris. He showed the group 3 patients who had been treated conservatively. They were symptomless, with the exception of some residual tenderness and rigidity. He stated that he had employed this treatment in 30 earlier cases.

Choice of Operation.—In the early part of 1900 a favorite operation for duodenal ulcer was a gastroenterostomy with the so-called exclusion operation around the

pylorus. It was considered good surgical technic to use plication sutures around the pylorus in a circumferential manner, so that food could not pass through the pylorus but instead would go by means of the short circuit, namely, the gastroenterostomy. This operation was extensively used by W. W. and C. H. Mayo, John B. Deaver, John B. Murphy, and many other famous surgeons of that period. It was soon discovered, however, that the exclusion operation did not answer the purpose. It was ineffective in preventing food from passing through the duodenum.

Posterior gastroenterostomy was a good effective procedure, from which patients received great comfort as a result of the neutralization of the acids in the stomach by the alkalies in the jejunum. The greatest argument against the posterior gastroenterostomy without resection was that secondary ulcers developed at the site of anastomosis, but when one considers the number of secondary ulcers that now follow the Polya or the Hofmeister operation, one notes that there is little difference in the incidence of ulcers following a simple gastroenterostomy as compared to that following the more complicated operations. Up to a few years ago, the latter technique was the routine I followed.

At the time of perforation, should the surgeon close the defect or resect the stomach and do a Billroth I or II operation? Zollinger and Williams reported 194 operations performed for peptic ulcer in which they employed Billroth I and II with very good results. When the Billroth I operation is performed, it is followed by vagotomy. In the majority of cases, the conservative operation of closure of the perforation is usually performed instead of a resection of the stomach.

Nowadays, whenever it can be performed, depending on the interval between the time of perforation and the time of operation, subtotal resection is performed, followed by a Polya or a Hofmeister procedure. Immediate radical resection of the stomach is safe; I have had no deaths following this procedure. The proper cases, however, must be selected for this operation. If simple closure is used, it may be necessary at some future time to do the major operation for recurrent symptoms of ulcer. Bisgard advocates immediate resection, because in 70 per cent of the cases in which a simple closure was made, symptoms of ulcer developed. Recently, performance of the Billroth I operation after the ulcer has been excised has been advocated, and a resection of the stomach performed. Many years ago this was the operation of choice, and I performed exactly that. If there is too much space between the excised portions, it is better to perform a Billroth II. The Billroth I operation is recommended whenever it can be performed.

Procrastination in the treatment of ulcers is rather dangerous, especially when the ulcers occur on the posterior wall of the stomach. They are usually malignant, although some operated upon have been benign. They are usually large, sometimes 1 or 2 inches (2.5 to 5 cm.) in diameter. They may become adherent to the pancreas, and are difficult to remove. In many instances the ulceration must be left on the anterior surface of the pancreas. When the stomach is mobilized, a large deficiency results in its wall. Resection of most of the stomach must then be performed. The remaining ulcer can be destroyed by fulguration or covered with a piece of fat.

Vagotomy.—Volumes of literature have accumulated on the pros and cons of vagotomy for peptic ulcer. Space does not permit me to enter into a discussion of the efficiency of this operation. My opinion can only be based upon what I have read and on the expression of others at medical meetings. I cannot discuss it from the practical standpoint, because I have never performed a vagotomy. It always seemed

to me an illogical operation, because, in addition to the vagotomy, one is almost always compelled to perform a posterior gastroenterostomy.

Although Dragstedt was not the first to advocate this operation, he deserves the credit for making the medical profession conscious of the fact that an operation of this type may be beneficial in healing peptic ulcers. Most surgeons consider vagotomy useful for its beneficial effect on gastrojejunal ulcer.

CONCLUSIONS

1. Controversy as to the treatment of peptic ulcer still exists.

2. Too much time is wasted by medical treatment leading eventually to perforation, hemorrhage and obstruction.

3. Opinions differ among surgeons as to the best time to operate for hemorrhage resulting from peptic ulcer.

4. Simple massive hemorrhage should be followed by operation. Repeated hemorrhage makes operation a necessity.

5. Perforated ulcers can be treated by simple closure of a perforation, massive resection of the stomach or no operation at all.

6. In the early 1900's, simple gastroenterostomy was the operation of choice. At present, the Billroth I and II and gastric resection, followed by the Polya or Hofmeister type of operation, are performed.

7. Vagotomy with posterior gastroenterostomy has become a popular operation. The author states that he has never performed vagotomy.

CONCLUSOES

1. A controvérsia quanto ao tratamento da úlcera péptica ainda existe.

2. Perde-se ainda muito tempo com o tratamento médico que eventualmente leva à perfuração, hemorragia e obstrução.

3. As opiniões entre os cirurgiões diferem quanto ao melhor tempo para se operar a hemorragia resultante da úlcera péptica.

4. A hemorragia maciça simples deveria ser acompanhada de operação. A hemorragia, repetida torna a operação uma necessidade.

5. Pode-se tratar úlceras perfuradas pelo simples fechamento de uma perfuração ressecção maciça do estômago ou nenhuma operação.

6. Nos princípios de 1900, a simples gastroenterostomia era a operação de escolha. Atualmente, a Billroth I e II e a resecção gástrica, acompanhadas pela operação do tipo Polya ou Hofmeister são feitas.

7. A vagotomia com gastroenterostomia posterior tornou-se uma operação popular. O autor declara que nunca fez a vagotomia.

SCHLUSSFOLGERUNGEN

1. Der Streit um die Behandlung des peptischen Geschwürs ist noch in vollem Gange.

2. Es wird zu viel Ziet mit medizinischer Behandlung verloren, was schliesslich zur Perforation, Blutung und Obstruktion führt.

3. Die Meinungen der Chirurgen über den besten Zeitpunkt der Operation wegen Blutungen eines peptischen Geschwürs sind geteilt.

4. Die einfache massive Blutung sollte operativ behandelt werden. Wiederholte Blutungen machen den chirurgischen Eingriff zur Notwendigkeit.

5. Durchgebrochene Geschwüre können mittels einfachen Verschlusses der Perforation, mit massiver Magenresektion oder auch ohne operativen Eingriff behandelt werden.

6. Im Anfang unseres Jahrhunderts war die einfache Gastroenterostomie die Operation der Wahl. Zurzeit werden Resek-

tionen nach Billroth I und II, gefolgt von der Polyaschen oder Hofmeisterschen Operation, ausgeführt.

7. Die Vagotomie mit einer hinteren Gastroenterostomie ist ein sehr beliebtes Verfahren geworden. Der Verfasser bemerkt, dass er niemals eine Vagotomie ausgeführt hat.

CONCLUSIONS

1. La controverse sur le traitement de l'ulcère peptique n'est pas terminée.

2. Le traitement médical fait perdre un temps précieux, il peut conduire à la perforation, à l'hémorragie et à l'obstruction.

3. Les opinions diffèrent quant au meilleur moment pour opérer en cas d'hémorragie par ulcère peptique.

4. L'hémorragie massive simple devrait être suivie d'une opération. Des hémorragies répétées rendent l'intervention indispensable.

5. Les ulcères perforés peuvent être traités par simple suture, par une résection massive, ou ne pas être opérés du tout.

6. Au début du siècle la gastroentérostomie simple était l'intervention de choix. Actuellement on pratique le Billroth I et II et la résection gastrique, suivis d'une opération du type Polya ou Hofmeister.

7. La vagotomie avec gastro-entérostomie postérieure est devenue courante. L'auteur déclare n'avoir jamais pratiqué de vagotomie.

CONCLUSIONI

1. Esistono ancora divergenti opinioni sulla cura dell'ulcera.

2. Troppo tempo ancora viene perduto con le cure mediche, col rischio di giungere alla perforazione, all'emorragia, alla stenosi.

3. Esistono opinioni diverse fra i chirurghi anche a proposito dell'epoca migliore per operare le ulcere sanguinanti.

4. Un'emorragia unica massiva deve essere operata. Le emorragie ripetute rendono l'intervento indispensabile.

5. Le perforazioni devono essere o suturate o trattate con la resezione ampia o non operate affatto.

6. All'inizio del 1900 la semplice gastroenterostomia era l'intervento di scelta. Attualmente si ricorre alla resezione secondo Billroth I e II o ad altri tipi di resezione secondo Polya o Hofmeister.

7. La vagotomia seguita da G.E.S. posteriore è un intervento che ha incontrato molto successo, ma l'autore non ha mai fatto una vagotomia.

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Surgical Treatment of Carcinoma of the Ampulla of Vater

LOUIS H. NASON, M.D., F.A.C.S.*

BOSTON, MASSACHUSETTS

CARCINOMA of the ampulla of Vater occurs not too rarely in elderly persons with a clinical picture of *painless but intermittent jaundice.* The possibility of a stone or of carcinoma of the pancreas is considered, but one does not think as often of a lesion at the ampulla. These are distinct pathologic entities with individual characteristics of their own. Their chronicity and the intermittence of symptoms seem characteristic. It is not at all uncommon to obtain a history of previous attacks of jaundice that cleared spontaneously.

In 1944 a 53-year-old patient presented herself to the clinic obviously suffering from obstructive jaundice. She had had three attacks of painless jaundice within the past three years, varying in duration from a few days to three weeks. Roentgen study revealed a polypoid lesion of the duodenum, and operation was advised. The patient refused and left the hospital. In 1949 she reappeared—again jaundiced. She had had "several" bouts of painless jaundice since her previous admission. The present attack was persistent, and she now agreed to operation. Roentgen examination revealed the previously noted polypoid lesion still present and larger than before. A Whipple type of operation was performed. The patient made a good convalescence and is alive and well today. Pathologic examination disclosed a large localized papillary carcinoma of the ampulla of Vater, with no evidence of spread.

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Submitted for publication Sept. 6, 1956.

This is a case in point. In addition, even during a given attack, the obstructive aspects vary and fluctuate in their severity, so that it is not uncommon to note a fluctuating serum bilirubin level. A patient may enter the hospital with a bilirubin value of 5 units, then have it run up to 8, then down to 5 and 3, and then up to 6 or 7 and then down again. Biopsy of the liver reveals a picture characteristic of obstructive cirrhosis. Repeated biopsies may show transient improvement. It is this fluctuation in the degree of obstructive jaundice that deserves emphasis. It is in sharp contrast to the situation observed with carcinoma of the head of the pancreas. With that unfortunate disease, once jaundice appears it is steadily progressive and there are no remissions.

The explanation for this variation lies in the pathologic characteristics of carcinoma of the ampulla and duodenum. These tumors are almost all of the papillary type —either papillomas or papillary carcinomas. They grow on stalks of various lengths and breadths and mechanically can produce intermittent plugging of the lumen of the ampulla. Furthermore, they are usually of a low degree of malignancy, which accounts for the fairly long histories and for the relatively high percentage of long-term operative cures. They are not extremely invasive; only in the late stages do they invade the pancreas or surrounding tissues through the duodenal wall, and lymph node metastases are late. Hence they lend themselves well to local operation. In the surgical series reported,

this type of lesion accounts for a high percentage of the good results obtained by either conservative methods or such radical procedures as the Whipple operation. I should like to present 4 cases in which I used a fairly conservative surgical approach with excellent results. There have been no deaths in this group, and the results to date are good. This is in sharp contrast to the situation after the Whipple procedure, which is much too massive for this type of lesion. It carries an operative mortality rate of 35 to 50 per cent, and, of the patients who have survived six months to a year, a high percentage of those proved to have carcinoma of the ampulla or the duodenum rather than carcinoma of the pancreas.

REPORT OF CASES

CASE 1.—M. P., a man aged 59, complained chiefly of painless jaundice. The laboratory data were consistent with obstructive jaundice. Roentgen study revealed a polypoid filling defect in the duodenum, in the region of the ampulla of Vater. At operation a papillary carcinoma of the ampulla was observed and resected. Convalescence was uneventful, and the jaundice cleared. Three years later the patient was reoperated on because of a new carcinoma, this time in the cecum. The duodenum was inspected and was normal except for some foreshortening in the length of the second portion.

CASE 2.—J. B., a man aged 62, had had three attacks of painless jaundice in the past six months, lasting from one week to two weeks each. Needle biopsy of the liver revealed a picture consistent with obstructive cirrhosis. The value for serum bilirubin was 5 units. Two days later it was 8.5, and four days later it was down to 6. Subsequent determinations revealed a minimum of 3 to another maximum of 7. Repeat biopsy revealed some improvement. Roentgen study suggested a filling defect in the duodenum at the ampulla of Vater. At operation a papillary carcinoma of the ampulla was discovered and resected. The patient has been followed for two and one-half years and is apparently well.

CASE 3.—J. J. S., a postman aged 66, had jaundice of ten days' duration, with no pain. He had been jaundiced three months earlier for about one week. The value for serum bilirubin was 4.5 units, increased to 7, receded to 5 and rose again to 7.5. Roentgen examination gave negative results. Operation was performed. A papillary carcinoma of the ampulla of Vater, 1 cm. in diameter, was observed and resected. There was no evidence of spread. Convalescence was uneventful, and the patient has remained well for the past twenty months.

CASE 4.—M. B., a man aged 69, complained of painless jaundice of one month's duration. A daughter thought that he had had several episodes of transient yellowish discoloration of the eyes over the past year. His son, a physician, had noted bile in his urine without visible jaundice, six months earlier. The serum bilirubin level was 9 units and fluctuated between 8 and 10. Roentgen study revealed a filling defect in the duodenum at the juncture of the second and third portions. At operation a papillary adenocarcinoma was observed and resected. The patient has remained well for the past eighteen months.

The procedure I have used begins with a transduodenal approach to the ampulla. The duodenum is opened transversely and the ampulla and its lesion are identified. The common duct is opened above the duodenum in the usual place, and a long Cattell tube is threaded down the duct through the ampulla. The duodenum is then mobilized so that the common duct can be traced along posteriorly and the head of the pancreas identified posteriorly. The posterior wall of the duodenum and the ampulla are resected transduodenally in a transverse elliptic fashion, the lower end of the common duct being removed and the pancreatic duct cut through. The duodenum (posteriorly) and the common duct are then anastomosed, and the pancreatic duct is sutured into the anastomosis with a small piece of rubber catheter tied into the duct and allowed to protrude into the duodenum. The T tube in the common duct is brought out through the new anastomosis and into the duodenum. The anterior opening (transverse) in the duodenum is then closed transversely.*

*For further decompression of the biliary tree a tube may be sewn into the gallbladder. This, of course, is not absolutely necessary. The T tube may be kept in for three to six weeks.

It is interesting that the common duct rarely traverses the substance of the pancreas; it simply lies alongside it, so that a pancreatic carcinoma occludes simply by compression of the common duct between it and the posteromedial aspect of the duodenum. This anatomic fact makes it technically easier to resect the lower end of the common duct and the pancreatic duct without entering the substance of the pancreas.

SUMMARY

A conservative surgical approach is recommended for extirpation of carcinoma of the ampulla of Vater. Four cases of carcinoma so treated are summarized. No deaths or complications occurred. They have been followed for from one and one-half to three and one-half years after operation. This more conservative procedure is suggested because it has not the high mortality rate of the Whipple operation and because the tumor is of low grade malignancy, remaining localized for long periods.

RÉSUMÉ

Une attitude plus conservatrice doit être adopté, plutôt que l'opération plus radicale de Whipple, pour le carcinome de l'ampoule de Vater. Cette lesion n'est pas très maligne, et n'a pas besoin d'un procedé massif radical.

RIASSUNTO

L'autore presenta 4 casi di carcinoma dell'ampólla di Vater. Questa lesióne non è molta maligna. Per conseguenza, egli raccomanda un accèsso conservativo in luogo dell'operazióne piu vasta anzi radicále di Whipple.

RESUMEN

El autor comunica 4 casos de carcinoma de la ampolla de Vater. Esta lesion no es extremamente maligna. Por esta razón, el autor recomenda uno acceso conservativo en lugar de operación radical de Whipple.

A large library is apt to distract rather than to instruct the learner; it is much better to be confined to a few authors than to wander at random over many.

—*Seneca*

Recurrent Hernias

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WITH improved knowledge of the anatomic and architechtonic aspects of the inguinal area there has admittedly been a great decrease in the incidence of recurrent hernia. Today, however, despite this widening knowledge, it is not a problem that can be said to be finally solved.

There has been a wide divergence of view with regard to the main causes of recurrence after operation for hernia. They are as follows:

Preoperative Causes.—1. Incorrect identification of the specific hernia.

2. Contemplated operation illogically planned; for example, it is unnecessary to carry out a plastic repair in any person under 20 years of age.

3. Inapplicable selection of patients for a specific operation on account of one or more factors which should be deterrent; for example, asthma, myocarditis, hemophilia and other serious blood diseases.

4. Improper or inefficient preparation.

Surgical Causes.—1. The type of anesthesia utilized. If the patient is unrelaxed during the operation there is union of tissue under tension; with spinal anesthesia there is a greatly reduced tendency to vomiting, distention and muscular strain.

2. Incomplete asepsis.

3. Improper selection of surgical technic.

4. Improper selection of site for incision.

5. Use of improper suture material.

6. Incautious handling of tissues.

7. Incomplete removal of hernial sac.

8. Negligence in the detection and treatment of the direct component of a so-called pantaloon or "sliding hernia"—a condition of surpassing importance.

9. Inefficient narrowing of the abdominal inguinal ring.

10. Inefficient repair of defects in the inguinal triangle.

11. Nontransplantation or nonremoval of the spermatic cord with or without the testicle when indicated, e.g., in older age groups.

12. Inadvertent severance of the ilio-inguinal or ilio-hypogastric nerves.

13. Failure to use, or improper use of, transplant material where clearly indicated.

14. Improper use, placement or retention of drainage tubes.

15. Incomplete hemostasis.

16. Bilateral operations in inappropriate persons.

Postoperative Causes. — 1. Persistent coughing.

2. Lifting of heavy weights.

3. Straining at bowel movements.

4. Severe manual effort before a minimum of three months after the operation.

5. Prostatic obstruction.

Varieties of Recurrence.—These are: (a) indirect, shown in lower illustration, Fig. 1; (b) direct (most common) at upper left, Fig. 2; (c) saddlebag (pantaloon) in Figure 3; (d) bladder, in Fig. 4; (e) Spigelian (along semilunar line), in Figure 5, and (f) sliding, in Figure 6.

Anatomic Background. — Any attempt

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to reduce the rate of recurrence following operations for external abdominal hernias must be based on a thorough knowledge of the anatomic features, developmental and surgical, of the areas involved, the myodynamics and gross pathologic changes caused by the protrusion itself and the changes induced by surgical trauma. Without this knowledge surgical procedures are likely to be fallacious and productive of unsatisfactory results.

The apertures in the abdominal wall and within the cavity for the passage of structures entering or emergent are: anteriorly, the umbilical (in the fetus) for the transmission of the umbilical vessels, the allantois and vitelline duct; superiorly, the vena caval opening for the inferior vena cava and right phrenic nerve, the aortic hiatus for the aorta, vena azygos major and thoracic duct, and the esophageal hiatus for the esophagus, the vagus nerve, and the esophageal branches of the left gastric artery and vein; inferiorly, in the groin, there are two openings on each side—one for the femoral vessels and the lumboinguinal nerve and the other for the spermatic cord and its constituent blood vessels in the male and the ligamentum teres in women. Thus one is confronted with a complex set of anatomic relations, especially with almost contiguous blood vessels.

The fundamental anatomic weaknesses in perivascular spaces are predisposing factors in many cases of hernia, especially the inguinal and femoral varieties. In the umbilical area, the hiatus is caused by the presence *in utero* of an umbilical cord that encloses the yolk stalk, the allantois and the fetal blood vessels. Under normal conditions the vitello-intestinal duct, the omphalomesenteric vessels and the urachus atrophy into fibrous cords; thus, after birth, blood no longer circulates in the vessels of the cord, and a small crust forms where the cord has been ligated and cut. In time fibrous changes take place and draw the scar against the circumference of the ring. These formed adhesions are less dense at the superior margin thereof than at the inferior one. With the consequent weakness of the myofascial structures, the hiatus is insecurely closed and often becomes the site of hernia. Because emergent blood vessels are not present in this zone after birth, repair of these hiatus defects is usually satisfactory. Complete closure invariably eliminates any weakness. Recurrences here are therefore rare.

In the femoral area, between the inguinal ligament and the ileopectineal line, the space is divided into two compartments by a band of iliac fascia that extends from the ligaments to the ileopectineal eminence lateral to the femoral vessels. The medial compartment (lacuna vasorum) is occupied by the femoral vessels and the so-called femoral "canal." Directly mesial to this area is the oval femoral ring, which serves as a path between the abdominal cavity and the thigh. Despite such firm structures as the pectineus muscle and fascia and the tense lacunar and inguinal ligaments present in the area of the femoral canal, hernias occur there owing to weakness in the perivascular space adjacent to the femoral vessels. This weakened area along and circumjacent to the blood vessels is, in effect, mechanically vulnerable. Repair must be circumspect here in order to eliminate the anatomic defect without encroaching upon the blood vessels. High ligation of the sac by the low or the high operation often proves ineffective (see first two lower illustrations, Fig. 7).

The Inguinal Area. — In the inguinal area the physiologic-anatomic condition is still more disadvantageous. There is, furthermore, a wide divergence of views with regard to the architectonics and myodynamics of the area. Again, one must also study the mechanics of the deep ab-

dominal ring in an endeavor to ascertain whether the mechanism there is similar to a shutter or valve. The success or failure of a surgical technic in a specific operation depends on punctilious work. The approximation and union of various muscular, aponeurotic and fascial structures and their derivatives to close the defect are not always adequate. The reasons are anatomic, physiologic and pathologic.

These reasons cannot be separately adjudged. The inguinal area lies superior to the inguinal ligament. Medial and inferior to it is the zone of the femoral space (peritoneal protrusion). The importance of a clear understanding of the relations of these areas explains the occasional occurrence of a femoral hernia after an inguinal hernioplasty, as well as the concurrence of two varieties. Dugdale and Burton named that part of the inguinopectineal area above the inguinal one the "major superior inguinal triangle," and the one inferior to it the "major inferior triangle." Here femoral hernia occurs.

The anatomic arrangement is as follows: The descent of the testis, the spermatic cord with its constituent blood vessels and the vaginal process of peritoneum produces a defect of variable extent at the deep abdominal ring. The same effect in the female is produced by the round ligament, but to a lesser degree.

The deep or inferior epigastric vessels arise from the external iliac directly proximal to the inguinal ligament and ascend along the medial aspect of the abdominal inguinal ring close to the posterior wall of the inguinal canal in extraperitoneal tissue. They then pierce the transversalis fascia below the semicircular fold of Douglas. The deep circumflex iliac artery also arises from the external iliac on its lateral aspect. It is manifest, therefore, that the vascular system, with its perivascular spaces, clearly produces weak areas. The deep ring is really a defect in the transversalis fascia left by the descent of the testis with the tunica vaginalis. This weak, ovoid hiatus, with an attenuated medial arc, must be repaired to narrow the opening. The proximity of inferior epigastric vessels leaves a weak perivascular space (Fig. 8, upper illustration).

The Abdominal Rings.—Many years ago Arthur Keith wrote that the rings are not fixed spaces. The modern concept, as formulated by Lytle, is that they are mobile and under stress, and that they move upward and laterally under cover of the internal oblique and transversus abdominis muscles. Observed posteriorly these rings are, in effect, pivots around which the transversalis fascia is arranged. This U-shaped structure of fibrous strands, deficient superiorly, is placed obliquely and vertically open midway between the anterior superior spine of the ilium and the symphysis pubis. Its medial border is firm, and its lower angle lies subjacent to the margin of the transversus abdominis muscle to permit free egress of the spermatic cord. The fibrous strands circumscribing the ring are firmly anchored, as "slings," to the deep surface of the transversus abdominis muscle. The prominent margin of this opening extends backward at an angle below the spermatic cord. Under anesthesia, according to Lytle, the mobility of the ring may be readily demonstrated. The stretch reflex, or closure mechanism, is activated to protect the inguinal canal. There is consequently a mechanism similar to that of a sliding valve rather than that of a sphincter shutter. Undue pressure on the spermatic cord therefore does not take place. Another important element in this action is the fact that the medial pillar is larger than the lateral one. The latter part is anchored to a less mobile part of the muscle, which, closer to its point of insertion, moves only slightly (Fig. 9, upper and middle drawings).

The Musculature in the Inguinal Area.—Over the inguinal area the external oblique muscle becomes aponeurotic before its insertion into the rectus sheath (see upper illustration, Fig. 8). It forms the anterior wall of the inguinal canal and is condensed into the inguinal ligament, reaching the pubic bone in this form. Arching fibers bind the margins of the ring and form the outer layer of the cord sheath. The fibers prevent enlargement of the subcutaneous ring and maintain the tone of the aponeurotic strands. The inguinal canal is thus formed by the inferior reflection of the external oblique muscle.

The inferior fibers of the internal oblique and transversus abdominis muscles, which arise together from the lateral half of the inguinal ligament, are properly part of the inguinal area. The fusion of these muscles lateral to the rectus muscle forms a fairly broad, strong band, which is inserted partly into the anterior rectus sheath but mainly into the pubic crest. This tendinous extension, which forms a firm arch posterior to the medial part of the canal, is variously called the inguinal falx, the falx aponeurotica, the tendo conjunctus or the conjoined tendon. The fibers of both muscles, together with this tendon, curve inferiorly and medially and then cross the cord obliquely. One can visualize their position in relation to the spermatic cord, at first anterior, then superior and finally posterior (Fig. 8, upper illustration).

A cremaster muscle and fibers are almost ineffectual so far as myodynamic function is concerned.

The Ilioinguinal and Iliohypogastric Nerves.—Division of the ilioinguinal nerve before it enters the internal oblique may paralyze the muscle and thus become a predisposing cause in the development of a direct inguinal hernia. Numbness and pain may occur as a result of the injury. Owing to the fact that at this level the fibers are only sensory, motor disturbances are not likely to ensue. Injury to the nerve may also occur as a result of incisions in the lower part of the abdomen (Fig. 1, upper illustration).

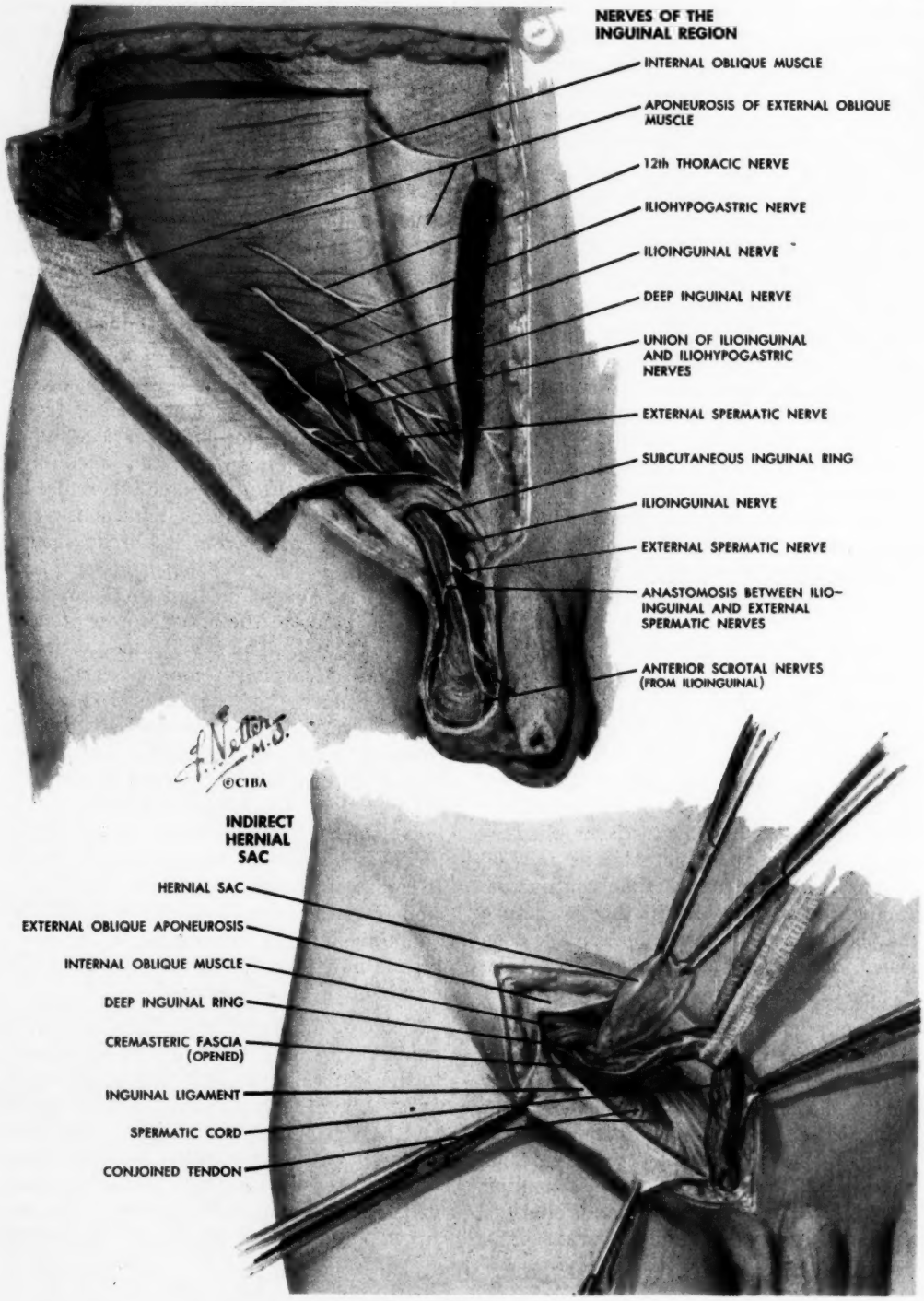
The iliohypogastric nerve supplies the skin of the gluteal area but not the penis. It also supplies the lower abdominal wall.

The ilioinguinal nerve comes from the first lumbar and supplies the skin of the pubis, the penis, the scrotum, the labia majora and the uppermost part of the medial aspect of the thigh.

The lumbar-inguinal division of the genitofemoral nerve, coming from the first and second lumbar, pierces the skin lateral to the femoral artery and about 1 inch (2.5 cm.) below the inguinal ligament. It supplies various areas of the skin distal to the intermediate part of the inguinal ligament.

The external spermatic division supplies the cremaster muscle and the skin over it.

The Transversalis Fascia and Ligaments.—According to Dr. J. C. Hayner, the brilliant anatomist, in the area of the lunette in Hesselbach's triangle the so-called transversalis fascia is fundamentally derived from true transversalis fascia, transversus muscle, intermediate fascia, internal oblique (cremasteric) muscle and superficial internal oblique (cremasteric) fascia, but maldevelopment, absorption and fusion may reduce stratification and muscular or fascial elements in a variable manner. The so-called transversalis fascia of the femoral sheath at times consists of two layers—derivatives of the internal oblique and transversus muscles. The internal oblique and transversus muscles decussate with each other in forming the cremasteric tunic of the cord at the abdominal inguinal ring, and the intermediate fascia becomes lost in that tunic. The abdominal ring should be regarded as a passage formed by trans-


NERVES OF THE INGUINAL REGION
INTERNAL OBLIQUE MUSCLE
APONEUROSIS OF EXTERNAL OBLIQUE MUSCLE
12th THORACIC NERVE
ILIOHYPOGASTRIC NERVE
ILIOINGUINAL NERVE
DEEP INGUINAL NERVE
UNION OF ILIOINGUINAL AND ILIOHYPOGASTRIC NERVES
EXTERNAL SPERMATIC NERVE
SUBCUTANEOUS INGUINAL RING
ILIOINGUINAL NERVE
EXTERNAL SPERMATIC NERVE
ANASTOMOSIS BETWEEN ILIO-INGUINAL AND EXTERNAL SPERMATIC NERVES
ANTERIOR SCROTAL NERVES (FROM ILIOINGUINAL)
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INDIRECT HERNIAL SAC
HERNIAL SAC
EXTERNAL OBLIQUE APONEUROSIS
INTERNAL OBLIQUE MUSCLE
DEEP INGUINAL RING
CREMASTERIC FASCIA (OPENED)
INGUINAL LIGAMENT
SPERMATIC CORD
CONJOINED TENDON

Fig. 1

versalis fascia, transversus muscle, intermediate fascia and a deep lamella of the internal oblique muscle. These muscular elements form the aponeurotic part of the inguinal falx, concealed by the more vertical fasciculi of the superficial lamella of the internal oblique muscle and its superficial fascia, and superimposed upon the transversalis fascia, which fuses with the aponeurosis at the linea semilunaris (Fig. 1, lower illustration).

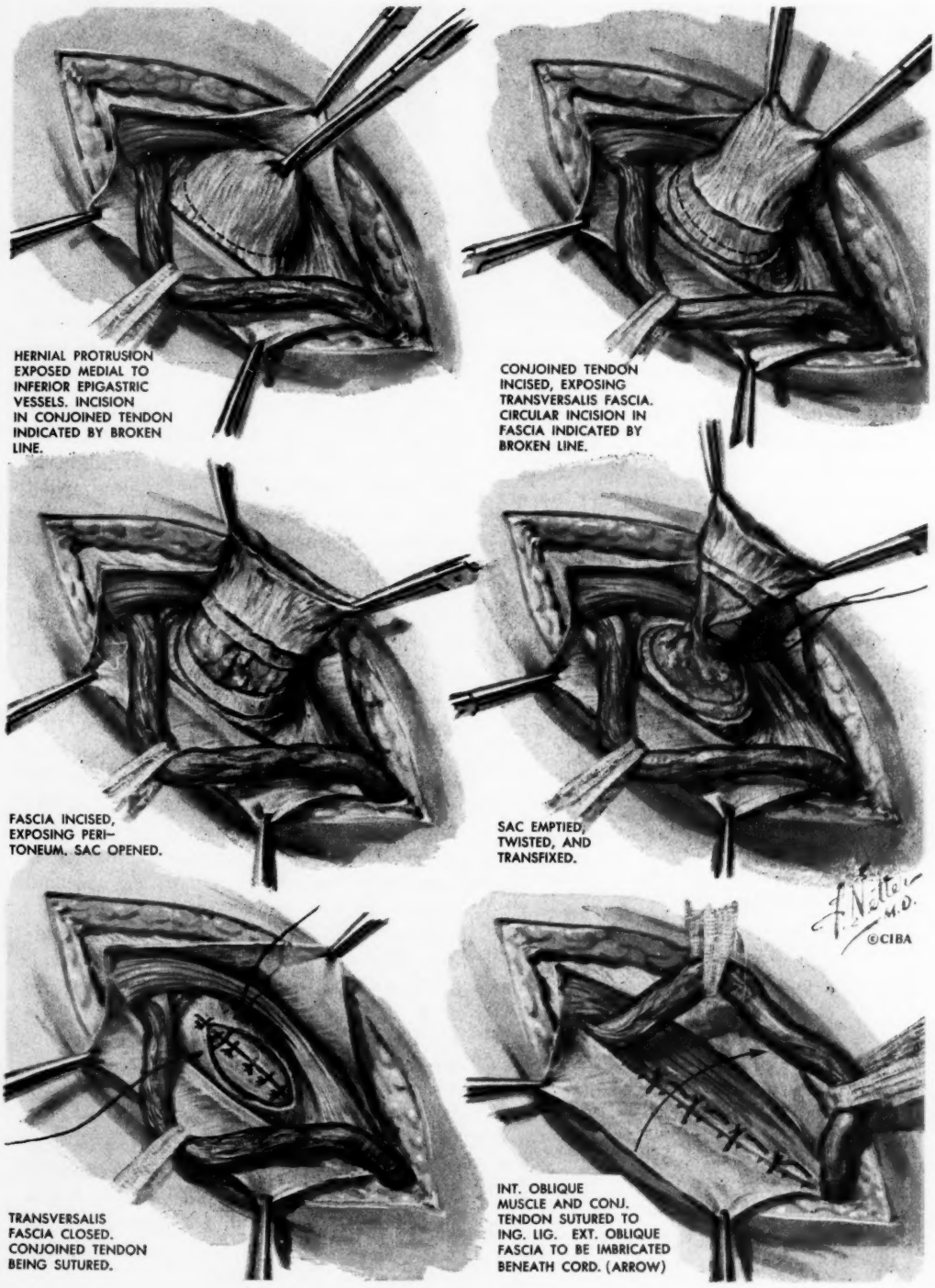
The transversalis fascia is of rather firm texture in the gap below the lower margin of the internal oblique and transversus abdominal muscles. It is inserted and actually continuous with the iliac fascia near its fusion with the inguinal ligament. The ligament of Henle (a lateral expansion of the rectus tendon) acts as a medial reenforcement for this fascia. The interfoveolar ligament, which extends from the inferior margin of the transversus muscle to the superior pubic ramus, acts furthermore as a vertical reenforcement directly medial to the deep abdominal ring. In the inguinal area the fascia is denser and firmer than in other areas, partly because of the reenforcement but also because of the fact that fibers of the conjoined tendon are blended with it down to the inguinal ligament. In all probability the firmer texture of the transversalis fascia is mainly due to the extra strands of fibrous tissue from the tendo conjunctus. (In surgical procedures this structure may be utilized advantageously.) The deep crural arch is a thickening of this fascia.

The transversalis fascia is subjacent to and contiguous with the deep layer of the investing fascia of the transversus abdominis. From the surgical point of view this fascial layer should be considered the deepest fascial plane of the abdominal wall, which is intimately related to the internal fascial bed of the transversus abdominis muscle. Fibromuscular strands derived from the internal oblique and transversus abdominis muscles, either separately or conjointly, form the tendo conjunctus, become embedded in and consequently strengthen the transversalis fascia. Only careful dissection reveals this union. A weak inguinal triangle is largely attributable to a deficiency in these supporting fibers rather than to attenuation of the transversalis fascia *per se*.

The inguinal, lacunar (Gimbernat's) and suprapubic (Cooper's) ligaments play an important part in the repair of inguinal hernia, direct or indirect, and also in its recurrence.

The inguinal ligament (also termed the anterior iliopubic ligament) arises from the anterior superior spine of the ilium and extends downward and medially, tensely stretched to the pubic tubercule. It passes convexly toward, and concavely above, the thigh. From its broad insertion there is an extension (the lacunar, Gimbernat's or ligamentum inguinopectineal medialis) to the upper border of the superior pubic ramus and the pectineal line. Its base, which is concave, forms the medial boundary of the femoral ring; its apex corresponds to the pubic tubercle. From the base of Gimbernat's ligament a strong fibrous band (Cooper's ligament) extends along the pectineal line, to which it is attached directly above the origin of the pectineal fascia with which it fuses. It is also strengthened by a lateral expansion from the lower part of the linea alba (adminiculum lineae albae). This structure is now used by some surgeons in the repair of inguinal hernias.

Cooper's ligament also fuses with the pubic periosteum. It lies directly medial to the femoral vein. The pectineus muscle arises from the pectineal line of the pubis and a narrow margin of bone below. It forms part of the inguinal femoral space and is covered anteriorly by the infolding of the fascia lata that continues down beneath the falciform margin of the saphe-


HERNIAL PROTRUSION EXPOSED MEDIAL TO INFERIOR EPIGASTRIC VESSELS. INCISION IN CONJOINED TENDON INDICATED BY BROKEN LINE.
CONJOINED TENDON INCISED, EXPOSING TRANSVERSALIS FASCIA. CIRCULAR INCISION IN FASCIA INDICATED BY BROKEN LINE.
FASCIA INCISED, EXPOSING PERI-TONEUM. SAC OPENED.
SAC EMPTIED, TWISTED, AND TRANSFIXED.
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TRANSVERSALIS FASCIA CLOSED. CONJOINED TENDON BEING SUTURED.
INT. OBLIQUE MUSCLE AND CONJ. TENDON SUTURED TO ING. LIG. EXT. OBLIQUE FASCIA TO BE IMBRICATED BENEATH CORD. (ARROW)

Fig. 2

Fig. 3.—Saddlebag hernia.

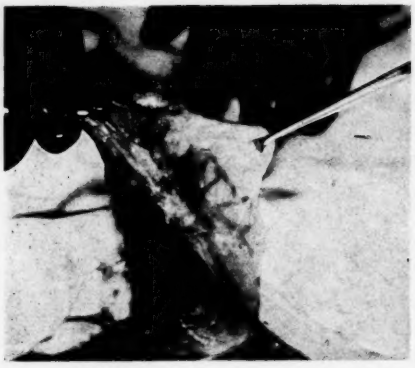


Fig. 4.—Large direct inguinal hernia. Bladder constituted entire hernia.

nous opening (Fig. 8, lower illustration).

Cooper's ligament is sometimes termed the iliopectineal ligament, because it overlies and is closely adherent to the iliopectineal line. It extends along the pecten of the superior pubic ramus to the pubic spine. Gimbernat's ligament should also be differentiated with regard to its origin, its insertion and its site, the iliopectineal medialis. In my opinion these names are better than the eponymic ones. The lacunar ligament is truly a curved extension of the insertion of the inguinal ligament placed medial to the annulus femoralis. The inguinal (Hesselbach's) triangle is not intrinsically weak but is the unguarded area of the abdominal wall because the internal oblique and transversus abdominis muscles do not cover it and perhaps fail to protect it.

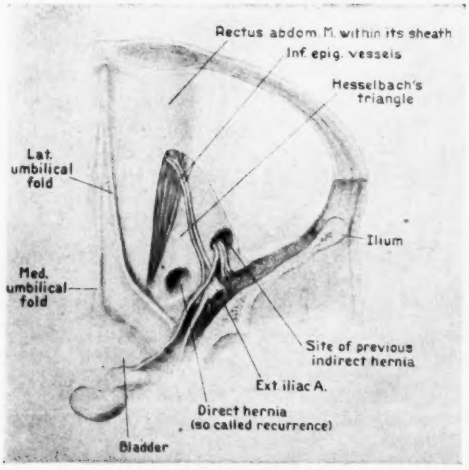


Fig. 5.—Spigelian hernia.

The Inguinal Canal.—The inguinal canal is a cleft in the anterior abdominal wall above the medial half of the inguinal ligament. In the male it contains the spermatic cord. It is about 1½ inches (3.7 cm.) long and extends from the deep ring to the subcutaneous inguinal ring. Its base is formed by the lateral part of the pubic crest, and its apex is directed upward and laterally. The anterior wall is formed by the aponeurosis of the external oblique muscle, and part of the internal oblique assists in its formation in the lateral third of the canal. The posterior wall is formed by the transversalis fascia. Its floor is formed by the upper half of the inguinal ligament and, at its medial end, by the lacunar ligament.

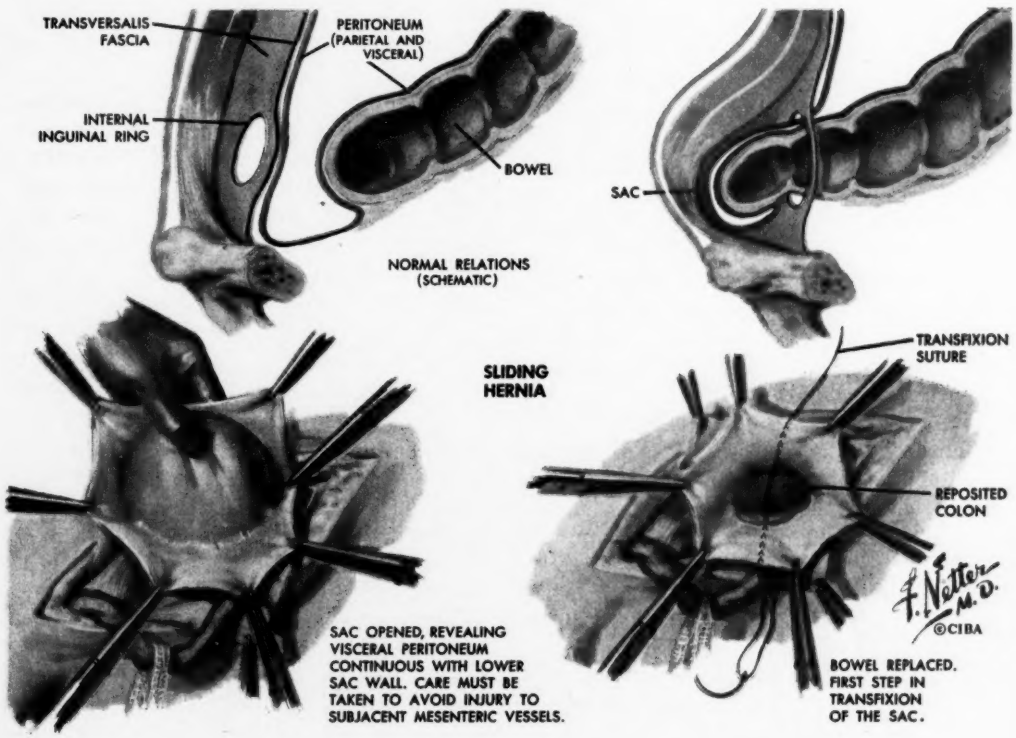
Union of Muscle and Fascia.—Selig and Chouke, after a thorough study of the moot question of the surgical union of muscle and fascia, came to the conclusion that "normal muscle will not unite firmly with fascia and ligament; it is

therefore useless to suture abdominal muscles to the inguinal ligament in the hope of buttressing a weak or ruptured abdominal wall." When it is approximated, however, to living fascial planes, firm union results. It has been proved that no structure derived from mesoderm can unite or heal without at first reverting to a state approaching the embryonal anlage.

Since the modern standardization of various technics in the surgical treatment of hernia, a constantly debated subject has been their advantages and disadvantages, particularly with regard to direct and indirect herniation. There has been little disagreement, however, concerning operations on patients in the younger age groups, who, as a rule, have good muscular and other supporting structures. High ligation of the sac and excision usually suffice for a permanent cure.

Take the Bassini operation, for example, or its numerous modifications. Some of the steps are clearly not only useless but harmful, in that the musculature is preternaturally stretched, which favors a recurrence. Then, too, suture of the conjoined tendon to the inguinal ligament is misconceived, owing to the fact that frequently there is no atony in the floor of the inguinal canal. Restriction of muscular movement usually results in disuse atrophy. Recurrence is thereby brought about by deranged myodynamics.

For indirect inguinal hernia in a muscular person in whom a deep ring is not greatly enlarged, a simple hernioplasty or herniorraphy, with repair of the transver-


TRANSVERSALIS FASCIA
PERITONEUM (PARIETAL AND VISCERAL)
INTERNAL INGUINAL RING
BOWEL
NORMAL RELATIONS (SCHEMATIC)
SAC
TRANSFIXION SUTURE
SLIDING HERNIA
REPOSITED COLON
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SAC OPENED, REVEALING VISCERAL PERITONEUM CONTINUOUS WITH LOWER SAC WALL. CARE MUST BE TAKEN TO AVOID INJURY TO SUBJACENT MESENTERIC VESSELS.
BOWEL REPLACED. FIRST STEP IN TRANSFIXION OF THE SAC.

Fig. 6

salis fascia deep to the muscles at the ring, is adequate. For a large hernia, direct or indirect, primary or secondary, a modification of the Wyllys-Andrews operation (Fig. 11), a fascia lata transplant or the use of tantalum mesh gauze is usually curative. The accompanying table briefly summarizes the various types of inguinal hernias and the operations for each.

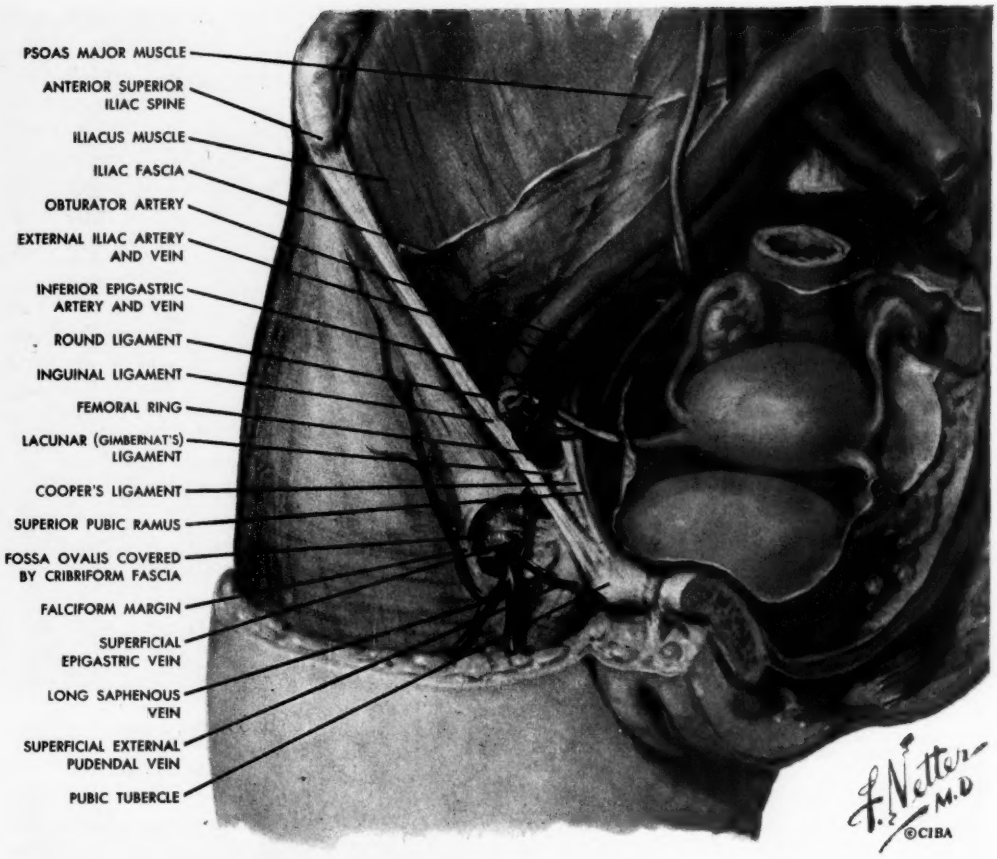
The Commonly Curative Technic.—An incision about 2½ to 3 inches (6.7 to 7.5 cm.) long is made, extending laterally from the pubic toward the anterior superior spine of the ilium. The incision is parallel to and ½ inch (1.2 cm.) above the inguinal ligament.

The superficial layer (Camper's) of the superficial fascia is then reached. Two Allis clamps are applied to the upper and lower skin margins. Gentle traction is made by means of the clamps so as to bring into view the three underlying vessels, namely, from medial to lateral aspects, the superficial external pudendal, the superficial epigastric and the superficial external iliac. With traction the tenuous fibers of Camper's fascia separate clearly, revealing these vessels. They are clamped. The supporting film of the deep layer of superficial fascia is then divided between the clamps, together with the vessels. Ligatures of fine catgut are then placed. The fibers of the external oblique aponeurosis come into view. The Allis clamps previously applied are held taut by an assistant. If necessary, a small retractor is inserted at the medial extremity of the wound, the subcutaneous or superficial inguinal ring being thereby exposed. Emerging through this opening, directly lateral to the pubis, the spermatic cord and the ilioinguinal nerve are seen. The cord appears to have an almost transparent film (the internal spermatic fascia) encompassing it, with some attenuated muscle fibers (the cremaster muscle). The external oblique aponeurosis is then divided from below medially, upward and laterally, care being exercised not to injure or sever the ilioinguinal and the iliohypogastric nerves. The latter nerve is craniad to the former and, unlike its counterpart, does not pass through the subcutaneous ring but pierces the external oblique aponeurosis slightly superior and lateral to the superior crus of the ring (Fig. 10, lower illustration).

Fine clamps are applied to the severed margins of the aponeurosis. Gentle traction is then made so as to bring the cord into view with its cremaster fibers. Weak filaments of transversalis fascia bind it to the posterior wall of the inguinal canal. The cord is now elevated digitally from its bed. The index finger is insinuated beneath it to separate the anchoring fibers, which are completely divided by finger dissection up to the deep inguinal ring.

The inguinal triangle then comes into view. This zone, as previously stated, is formed by the transversalis fascia reenforced by extensions of the tendoconjunctus. At the lateral end, directly medial to the cord and the deep ring, these reenforcements are very strong (interfoveolar ligament of Hesselbach). With careful observation the pulsating inferior epigastric vessels can be seen, owing to their color and pulsations. They lie in the extraperitoneal tissues.

The cord is elevated by finger traction. It is inspected for abnormalities. The vas deferens must be identified. Occasionally, when one raises the cord from its bed, this structure may inadvertently be left in its original position. If this is the case it should be gently manipulated into its normal position. The character of the musculoaponeurotic structures is then studied. Care must be taken to separate the ilioinguinal and iliohypogastric nerves from their contiguity to the cord, so that they may not be injured in the subsequent steps of the operation.

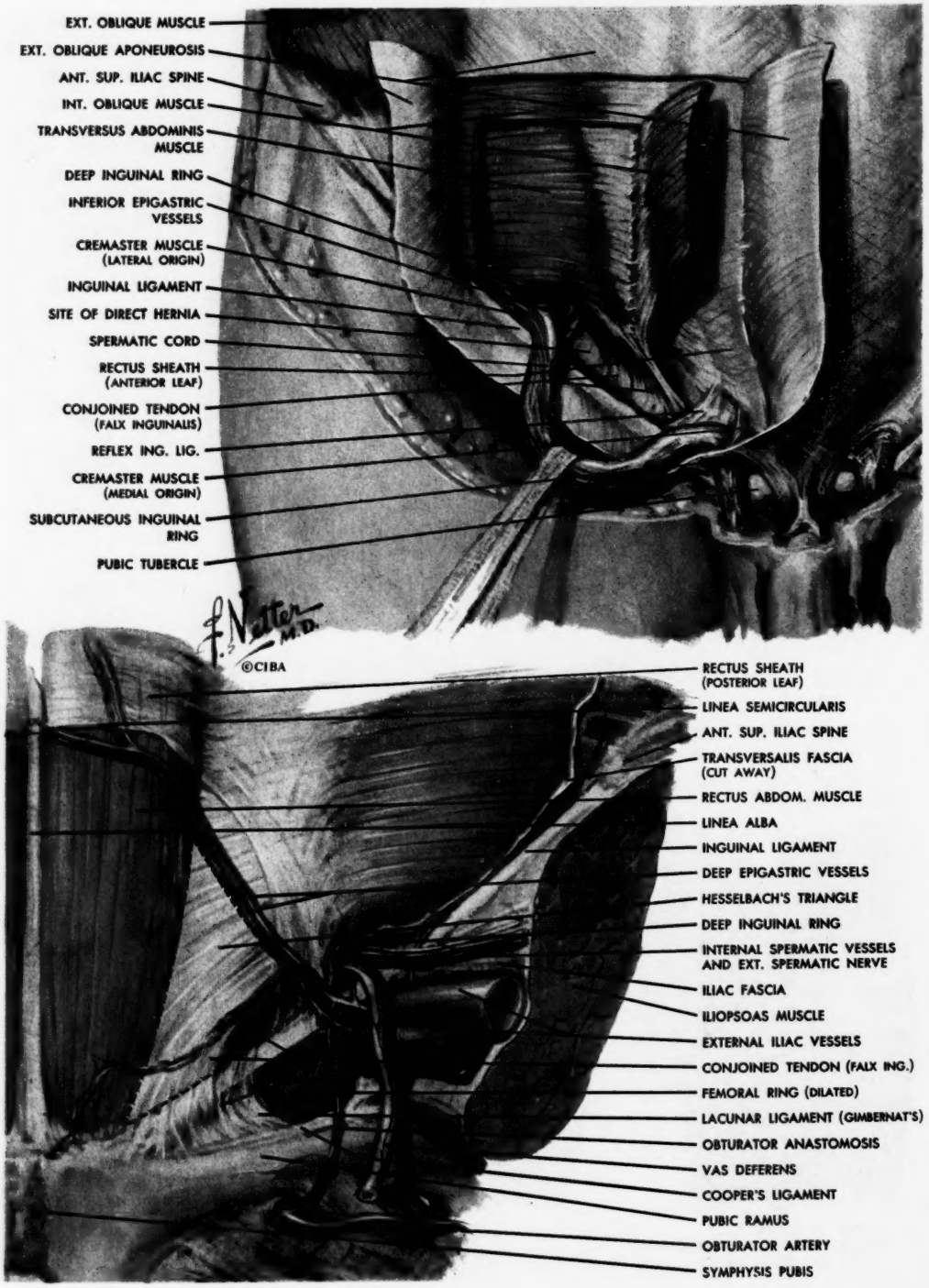


COURSE OF HERNIAL SAC THROUGH FEMORAL RING, FEMORAL CANAL, AND FOSSA OVALIS

SAC TURNED UPWARD OVER INGUINAL LIGAMENT ALONG SUPERFICIAL EPIGASTRIC VEIN

BILOCULAR SAC DUE TO ABERRANT OBTURATOR ARTERY

Fig. 7


EXT. OBLIQUE MUSCLE
EXT. OBLIQUE APONEUROSIS
ANT. SUP. ILIAC SPINE
INT. OBLIQUE MUSCLE
TRANSVERSUS ABDOMINIS MUSCLE
DEEP INGUINAL RING
INFERIOR EPIGASTRIC VESSELS
CREMASTER MUSCLE (LATERAL ORIGIN)
INGUINAL LIGAMENT
SITE OF DIRECT HERNIA
SPERMATIC CORD
RECTUS SHEATH (ANTERIOR LEAF)
CONJOINED TENDON (FALX INGUINALIS)
REFLEX ING. LIG.
CREMASTER MUSCLE (MEDIAL ORIGIN)
SUBCUTANEOUS INGUINAL RING
PUBIC TUBERCLE
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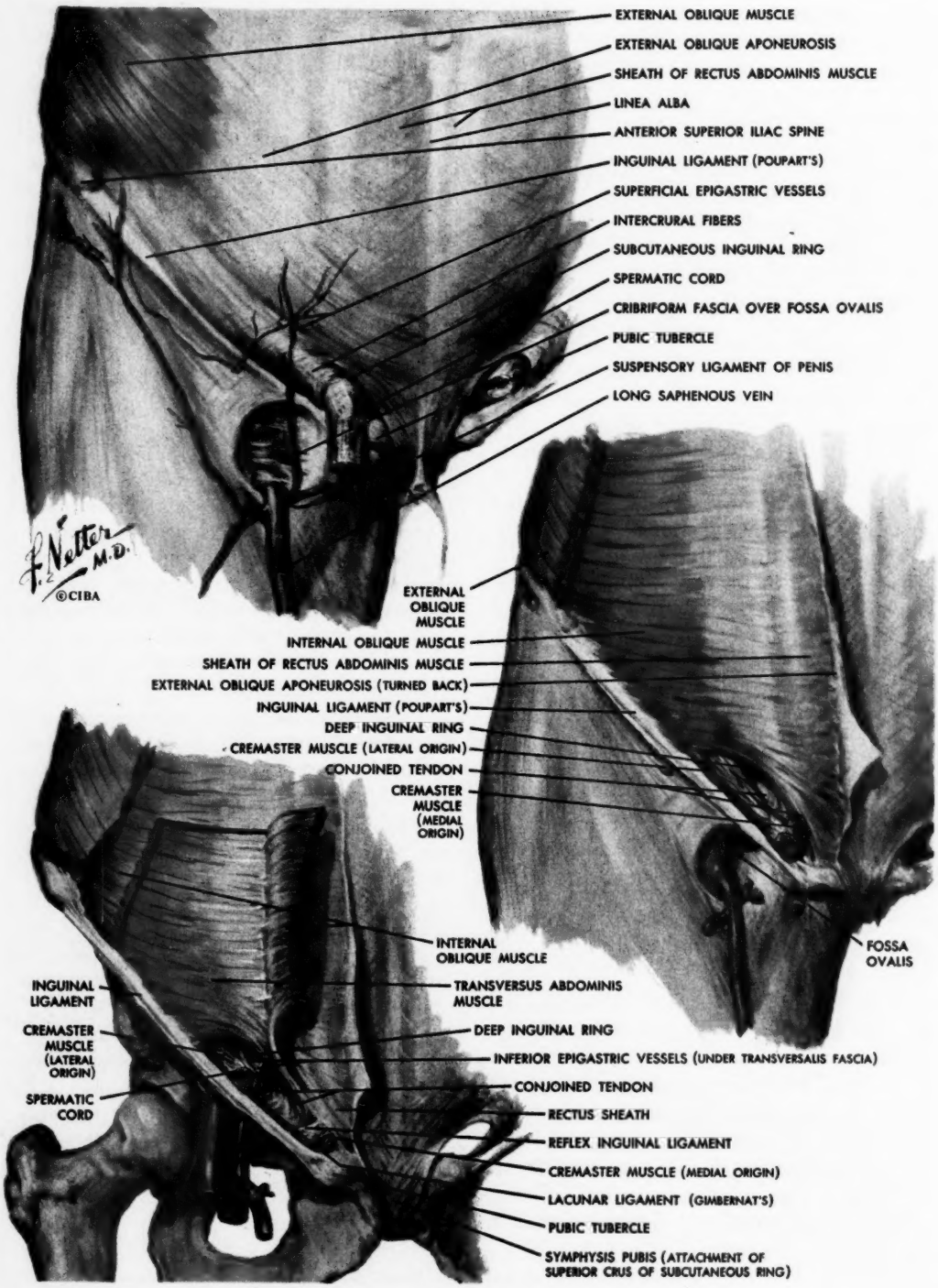
RECTUS SHEATH (POSTERIOR LEAF)
LINEA SEMICIRCULARIS
ANT. SUP. ILIAC SPINE
TRANSVERSALIS FASCIA (CUT AWAY)
RECTUS ABDOM. MUSCLE
LINEA ALBA
INGUINAL LIGAMENT
DEEP EPIGASTRIC VESSELS
HESSELBACH'S TRIANGLE
DEEP INGUINAL RING
INTERNAL SPERMATIC VESSELS AND EXT. SPERMATIC NERVE
ILIAC FASCIA
ILIOPSOAS MUSCLE
EXTERNAL ILIAC VESSELS
CONJOINED TENDON (FALX ING.)
FEMORAL RING (DILATED)
LACUNAR LIGAMENT (GIMBERNAT'S)
OBTURATOR ANASTOMOSIS
VAS DEFERENS
COOPER'S LIGAMENT
PUBIC RAMUS
OBTURATOR ARTERY
SYMPHYSIS PUBIS

Fig. 8


EXTERNAL OBLIQUE MUSCLE
EXTERNAL OBLIQUE APONEUROSIS
SHEATH OF RECTUS ABDOMINIS MUSCLE
LINEA ALBA
ANTERIOR SUPERIOR ILIAC SPINE
INGUINAL LIGAMENT (POUPART'S)
SUPERFICIAL EPIGASTRIC VESSELS
INTERCRURAL FIBERS
SUBCUTANEOUS INGUINAL RING
SPERMATIC CORD
CRIBRIFORM FASCIA OVER FOSSA OVALIS
PUBIC TUBERCLE
SUSPENSORY LIGAMENT OF PENIS
LONG SAPHENOUS VEIN
F. Netter M.D.
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EXTERNAL OBLIQUE MUSCLE
INTERNAL OBLIQUE MUSCLE
SHEATH OF RECTUS ABDOMINIS MUSCLE
EXTERNAL OBLIQUE APONEUROSIS (TURNED BACK)
INGUINAL LIGAMENT (POUPART'S)
DEEP INGUINAL RING
CREMASTER MUSCLE (LATERAL ORIGIN)
CONJOINED TENDON
CREMASTER MUSCLE (MEDIAL ORIGIN)
INTERNAL OBLIQUE MUSCLE
FOSSA OVALIS
INGUINAL LIGAMENT
TRANSVERSUS ABDOMINIS MUSCLE
CREMASTER MUSCLE (LATERAL ORIGIN)
DEEP INGUINAL RING
INFERIOR EPIGASTRIC VESSELS (UNDER TRANSVERSALIS FASCIA)
SPERMATIC CORD
CONJOINED TENDON
RECTUS SHEATH
REFLEX INGUINAL LIGAMENT
CREMASTER MUSCLE (MEDIAL ORIGIN)
LACUNAR LIGAMENT (GIMBERNAT'S)
PUBIC TUBERCLE
SYMPHYSIS PUBIS (ATTACHMENT OF SUPERIOR CRUS OF SUBCUTANEOUS RING)

Fig. 9

The sac is then sought on the superomedial surface of the cord, its normal position. It is grasped with one or two fine clamps. Fairly firm traction is made upward and downward on the entire cord. The sac is completely separated from the cord down to the deep ring (Fig. 11). A Penrose or moist gauze drain is placed around the cord, so that by careful manipulation it is kept out of the surgical field. The sac is palpated to determine the presence of contents and then opened. The interior thereof is examined visually and then by finger exploration to ascertain the presence or absence of a sliding hernia or other content. An almost translucent, thin-walled sac, together with a fairly normal deep ring, indicates the probable presence of a hernia of recent origin. A thick-walled opaque sac with a dilated ring usually bespeaks a long-standing condition. With upward traction the sac is twisted upon itself, care being taken that any contents present have been replaced in the abdominal cavity. A transfixion strand of chromic No. 1 catgut on a round pointed, curved needle of medium size is then inserted to a point directly below the deep ring and tied firmly at the same time, while the sac is gradually untwisted to allow complete approximation of its walls (Fig. 11). A similar suture may be inserted but is usually unnecessary. The sac is then severed about ½ inch (1.2 cm.) distal to the suture line so as to remove the redundant distal part. The proximal stump is permitted to drop back into the deep ring. It is not transfixed to the musculature, lest a nerve be injured.

If there is a weak area in the inguinal triangle, the following procedure is carried out: Muscular elements of the internal oblique and transversus abdominis muscles, together with some subjacent tendo conjunctus fibers, are sewn to the shelving part of the inguinal ligament. This is accomplished with interrupted chromic sutures on a curved, round pointed needle. This shortens the superior and inferior widths of the triangle and reenforces it. The most lateral suture, directly medial to the cord, is placed in a circumspect manner to avoid injury to the inferior epigastric vessels. Enough room must be left for egress of the spermatic cord so as not to obstruct its blood circulation. The reenforcing fibers of the tendo conjunctus at times are very firm.

Of importance is the plication of the interfoveolar ligament. Throughout this step the cord is retracted upward. A retractor is inserted directly beneath the upper leaf of the external oblique muscle, while the clamp previously applied to the lower leaf is used as a retractor. Tying the sutures too firmly is avoided, in order to prevent pressure necrosis; in suturing musculature, however, some minor degree of muscle degeneration and replacement by fibrous tissue is unavoidable. This is necessary because muscle itself does not unite to approximated aponeurotic or fascial fibrous tissue unless it is first converted into fibrous tissue.

(The aforementioned technic need not be followed if there is no weakness in Hesselbach's triangle, especially in a young patient.)

The cord drops into its normal position on removal of the elevating gauze. The two leaves of the external oblique muscle are then approximated and united with interrupted sutures of No. 1 chromic catgut down to the pubic bone. Adequate space is left for the cord in the new subcutaneous ring.

If the inguinal structures are weak, additional steps are designed to fortify the triangle by overlapping the aponeurotic flaps. The upper free margin of the external oblique aponeurosis is sutured to the shelving part of the inguinal ligament with interrupted No. 1 chromic catgut sutures.

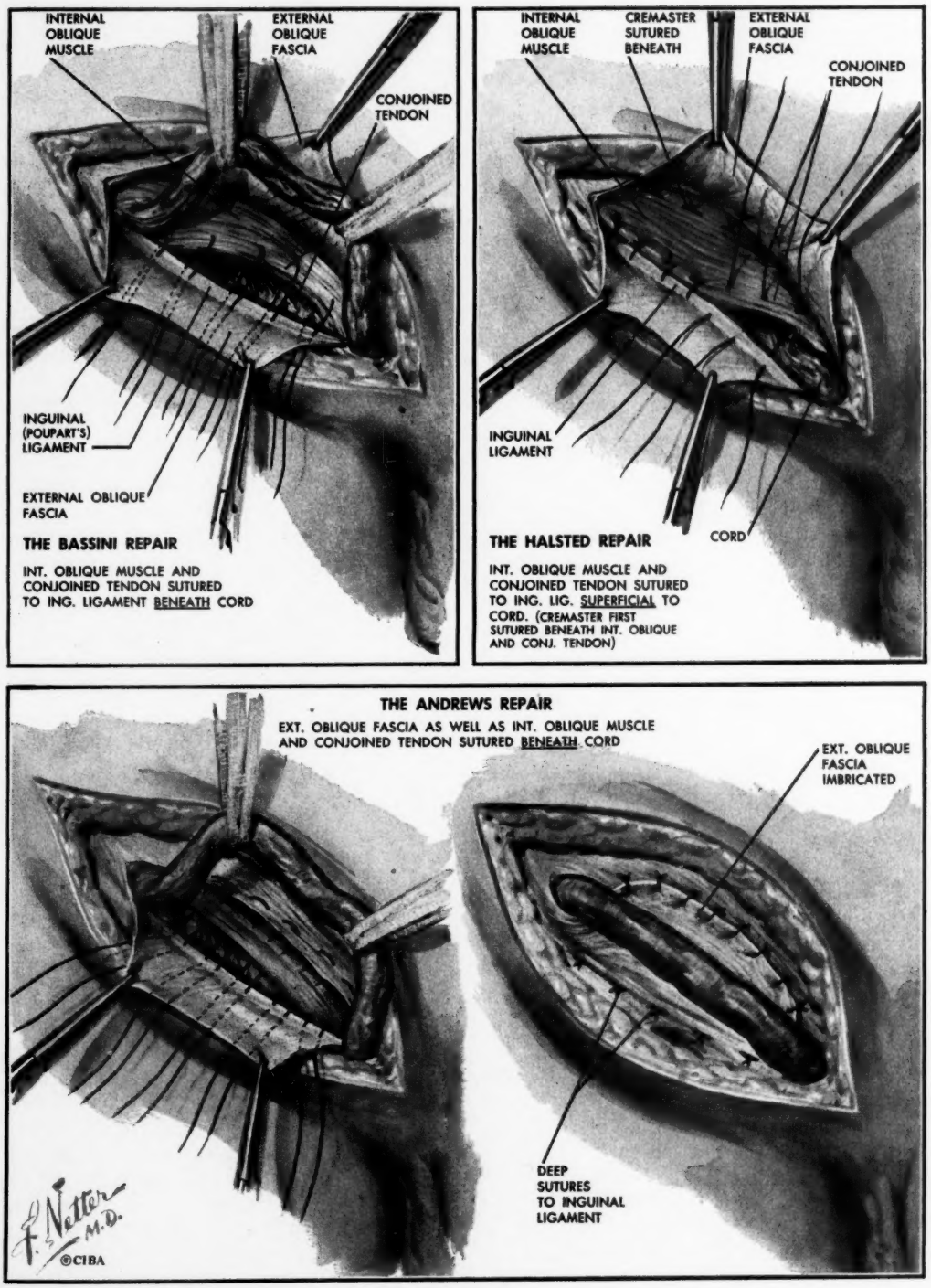
INTERNAL OBLIQUE MUSCLE
EXTERNAL OBLIQUE FASCIA
CONJOINED TENDON
INGUINAL (POUPART'S) LIGAMENT
EXTERNAL OBLIQUE FASCIA
THE BASSINI REPAIR
INT. OBLIQUE MUSCLE AND CONJOINED TENDON SUTURED TO ING. LIGAMENT BENEATH CORD
INTERNAL OBLIQUE MUSCLE
CREMASTER SUTURED BENEATH
EXTERNAL OBLIQUE FASCIA
CONJOINED TENDON
INGUINAL LIGAMENT
CORD
THE HALSTED REPAIR
INT. OBLIQUE MUSCLE AND CONJOINED TENDON SUTURED TO ING. LIG. SUPERFICIAL TO CORD. (CREMASTER FIRST SUTURED BENEATH INT. OBLIQUE AND CONJ. TENDON)
THE ANDREWS REPAIR
EXT. OBLIQUE FASCIA AS WELL AS INT. OBLIQUE MUSCLE AND CONJOINED TENDON SUTURED BENEATH CORD
EXT. OBLIQUE FASCIA IMBRICATED
DEEP SUTURES TO INGUINAL LIGAMENT
F. H. Netter M.D.
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Fig. 10

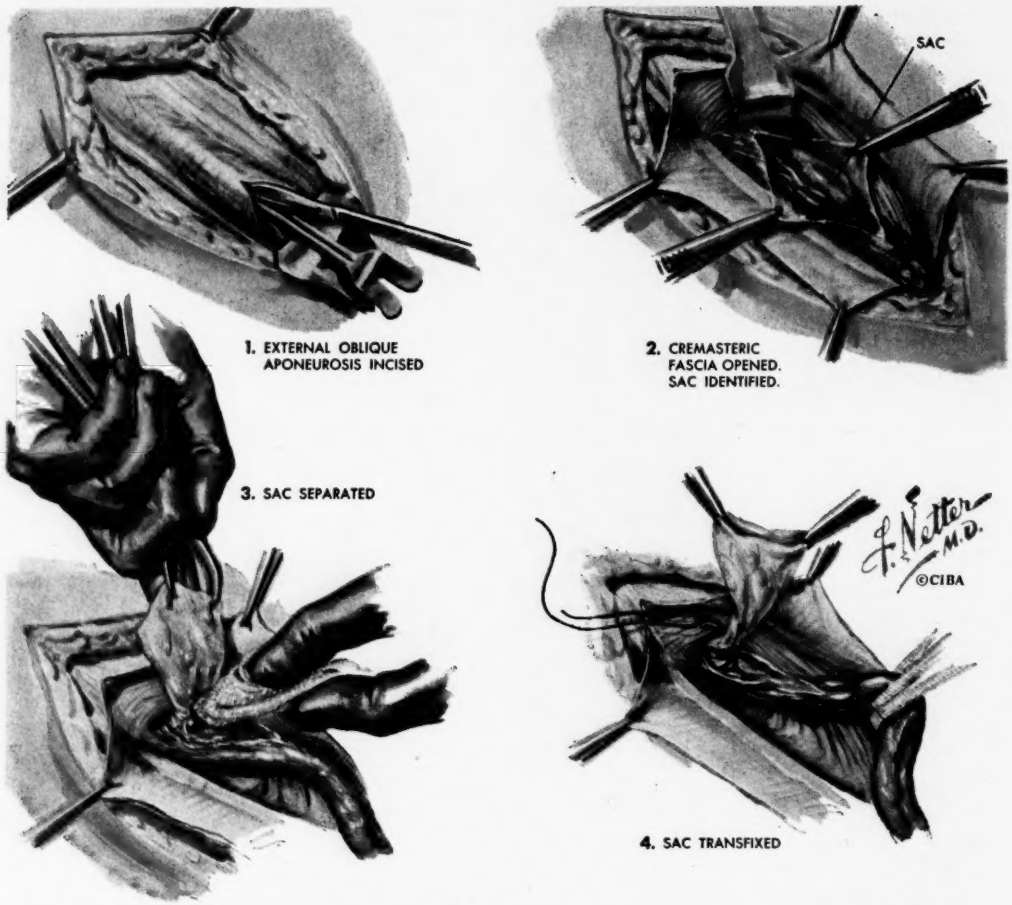

Fig. 11

Some surgeons maintain that suturing the abdominal musculature (external oblique aponeurosis) to the inguinal ligament results in an upward pull, thus partly displacing the inguinal ligament in that direction. This, it is maintained, predisposes to the formation of a new hernia beneath, be it inguinal or femoral. This conclusion is erroneous on anatomic and physiologic grounds. Furthermore, an accurate use of the method for reenforcing the inguinal triangle is all that is required. Then, again, it is technically difficult, and for an inexperienced surgeon hazardous, to utilize the iliopectineal (Cooper's) ligament as an anchorage for the external oblique aponeurosis. The fact that the femoral vessels are in close proximity, directly lateral and superior to it, render the insertion of a needle into the ligament dangerous. Only rarely may Cooper's ligament procedure be used.

It is advisable, however, to place one of the sutures through the lacunar ligament, approximating it to the lower extremity of what will become the superior crus of the new subcutaneous ring.

The final step in the hernioplasty con-

sists in approximation of the lower flap of the external oblique aponeurosis to the anterior surface of the upper leaf in a close, but not too tight, manner. The most lateral suture must be placed directly medial to the cord to reenforce the structures surrounding the deep ring, but not, as has been stated, close enough to compress the cord (Fig. 11). The cord then emerges through a cleft in the aponeurosis opposite the deep ring and passes subcutaneously toward the scrotum. In some patients it is necessary to remove the cord and leave the testis. The external oblique aponeurosis is closed over the deep ring, leaving no space. (The testis does not atrophy.)

The skin is then approximated and united in the usual manner. It is unnecessary to suture the layers of the superficial fascia.

Use of Tantalum Gauze. — The transcendent value of tantalum gauze in the repair of massive and/or recurrent ventral hernias has been confirmed by a long line of great surgeons.

The gauze, trimmed to approximate the area to be reenforced, is thoroughly cleansed with soap and water, rinsed, wiped with alcohol and ether and finally autoclaved.

In cases of recurrent inguinal hernia, for example, the gauze covers the hiatus in the transversalis fascia. It is anchored to Cooper's ligament, the anterior psoas fascia and the posterior aspect of the internal oblique muscle. (The gauze can be placed between the peritoneum and the skin in the absence or deficiency of fascia.) Or it may be sutured medially to the pubic periosteum, to the margin of the rectus sheath and laterally to the shelving edge of the inguinal ligament.

The local conditions present suggest the technic to be followed. The cut edges of the gauze are infolded about 0.5 to 1 cm. to allow secure insertion of the sutures (braided tantalum wire) and to avoid possible fraying or exposure of the cut margins of the implant within the contiguous tissues. The tantalum wire is placed without tension in contiguous strong fascia or aponeurosis. (Moderately fine silk may be used to suture the gauze into position.)

In the utilization of the gauze it is well to keep in mind the following points:

1. In the repair of inguinal hernia the mesh may be utilized to reenforce Hesselbach's triangle, where large tissue areas are weak.

2. The gauze can be deposited above or subjacent to fascia.

3. A sufficient amount of subcutaneous tissue should remain under the skin flaps.

4. The strands of monofilament, 10 mm. tantalum are cut "on the square knot." The ends are crossed in V fashion, the apex of the V being directly above the knot. Some surgeons urge the use of stainless steel wire. In my own opinion, this is disadvantageous, owing to the possibility of electrolytic corrosion and/or irritation.

In my experience the use of tantalum gauze for various recurrent or massive hernias has been highly successful.

SUMMARY

The causes of recurrent hernia may be classified as presurgical, surgical and postsurgical.

A profound knowledge of anatomy and the implications of congenital and abnormal defects is essential to the surgical treatment of hernia. It is most important to bear in mind the pathologic state preceding the operation and the pathologic changes caused by surgical maneuvers in the prevention of recurrence.

There is no standard surgical procedure for each type of hernia. The technic adopted depends upon the condition present. At times, especially with recurrent hernias, the use of exogenous matter, such

Types of Inguinal Hernia and Operations for Repair

Varieties	*Sac*	*Transversalis Fascia*	*Secondary Protrusion*	*Repair*	*Closure*
1st degree	Indirect	Normal	None	Sac ligation	Normal
2d degree	Indirect	Weak	None	Sac ligation, plication of fascia	Modified Wyllys-Andrews
3d degree	Saddle-bag or pantaloon	Weak	Yes	Conversion into indirect sac or ligation of both sacs separately; plication of fascia	Modified Wyllys-Andrews with or without fascia lata transplant
4th degree	Saddle-bag or pantaloon	Weak	Bladder diverticulation	Ligation of indirect sac; bladder diverticulectomy; plication of fascia	Modified Wyllys-Andrews; bladder diverticulectomy with or without fascia lata transplant or tantalum mesh implant

Note: in patients beyond 60 years of age, the cord should be removed in addition, to permit complete obliteration of deep ring.

as tantalum, is extremely valuable.

Finally, the classification on p. 426 is presented as a guide in the surgical treatment of hernia.

RÉSUMÉ

Les causes de la hernie récidivante peuvent être pré-opératoires, opératoires et post-opératoires.

Une connaissance approfondie de l'anatomie et des implications des lésions congénitales et pathologiques et essentielle pour le traitement chirurgical de la hernie. Il est des plus important de tenir compte de l'état pathologique pré-opératoire et des modifications pathologiques causées par les techniques chirurgicales en vue d'éviter une récidive.

Il n'existe pas de technique opératoire-type de la hernie. La technique doit être adaptée à l'état du patient. Parfois, surtout en cas de hernie récidivante, l'emploi d'une substance exogène telle que le tantale, est des plus précieux.

RESUMEN

Las causas de hernia recidivada pueden clasificarse en prequirúrgicas, quirúrgicas y postquirúrgicas.

Para el tratamiento quirúrgico de la hernia es importante un conocimiento profundo de la anatomía, de los fundamentos embriológicos y de los defectos anatómicos. También es de gran importancia el tener presente el estado patológico previo a la operación y los cambios patológicos producidos por las maniobras quirúrgicas en la profilaxis de la recidiva.

No existe un procedimiento quirúrgico tipo para cada variedad de hernia. La técnica elegida depende del estado particular. En ocasiones, particularmente en las hernias recidivadas, es de gran valor el uso de materias exógenas tales como el tántalo.

ZUSAMMENFASSUNG

Die Ursachen für rückfällige Hernien lassen sich in prächirurgische, chirurgische und postchirurgische einteilen.

Für die chirurgische Behandlung der Hernien ist eine sorgfältige Kenntnis der Anatomie und der Bedeutung angeborener und abnormaler anatomischer Defekte wesentlich. Von grösster Wichtigkeit ist es, den pathologischen Zustand vor der Operation und die durch chirurgische Eingriffe zur Verhütung von Rückfällen hervorgerufenen krankhaften Veränderungen nicht aus dem Auge zu verlieren.

Es gibt kein chirurgisches Standardverfahren für jede einzelne Form der Hernie. Die anzuwendende Technik hängt von den gegebenen Krankheitsbedingungen ab. In manchen Fällen, besonders bei rückfälligen Hernien, ist die Verwendung körperfremder Stoffe wie z. B. Tantal von grossem Nutzen.

RIASSUNTO

Le cause della recidiva dell'ernia possono essere classificate come prechirurgiche, chirurgiche e postchirurgiche.

E' necessaria una profonda conoscenza della anatomia e delle cause congenite o anatomiche dell'ernia per una cura chirurgica soddisfacente. E' importante anche conoscere le condizioni patologiche precedenti l'intervento e le modificazioni successive al fine di evitare la recidiva.

Non esiste una terapia chirurgica standard per ogni tipo di ernia; latecnica da adottarsi dipende dalle condizioni del paziente. In certi casi, e specialmente nelle ernie recidive, è di estremo aiuto l'impieg o di sostanze plastiche.

SUMARIO

As causas de hérnia recidivantes podem ser classificadas como pré cirúrgicas, cirúrgicas ou pós cirúrgicas.

Um conhecimento profundo da anatomia e das complicações de defeitos anatômicos congênitos e anormais é essencial para o tratamento cirúrgico da hérnia. É muito importante ter-se em mente e estado patológico que precede à operação e as alterações patológicas causadas por manobras cirúrgicas na prevenção da recidiva.

Não há um método cirúrgico padrão para cada tipo de hérnia. A técnica adotada depende da condição presente. Às vêzes, especialmente com hérnias recidivantes, o uso de matéria exógena, tal como o tântalo, é extrememente valioso.

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Angiographic Study of Infants and Children

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ALTHOUGH angiographic study has become a standard diagnostic procedure, relatively few reports are available concerning its application to pediatric problems. The reasons for this are apparent when one considers the nature of neurosurgical diseases in infancy and childhood in contrast to that of the same conditions in adults. Aneurysms are practically nonexistent; tumors are usually subtentorial, and differentiation between degenerative vascular disease and surgical lesions is not necessary. Although these factors account for the relative infrequency of angiographic study in pediatrics, in selected cases it is an extremely valuable diagnostic tool. Although somewhat more difficult and time-consuming with children than with cooperative adults, it does not carry the same hazard of untoward reaction that exists with the latter group.

An account of the largest series so far reported appeared in a recent publication from the New York Neurological Institute. Poser and Taveras[1] stressed the fact that the procedure is accompanied by few complications; in their series of angiograms on 90 children there was only 1 instance of transient hemiparesis, and this was ipsilateral to the arterial injection. On the other hand, Tarlov and Rosenberg[2] reported 3 deaths from angiographic studies with diodrast in hydrocephalic children—the only complications they encountered in a series of angiograms on 13 children. The histologic picture in each of the fatal cases was described in detail—the only such descriptions of which I am aware—and included marked endothelial proliferation and pericapillary hemorrhages and edema associated with loss of normal cerebral architecture. Perese and his associates[3] also reported the death of a child, the only fatality in a series of 234 angiograms. Although their pathologic description did not state that hydrocephalus was present, the clinical description certainly suggests that it was. The child, 7 years old at the time of the angiographic procedure, had an arteriovenous malformation, and it is usually assumed that this type of lesion is protective, in that it is accompanied by a rapid circulation time and an excessive blood supply to the brain. I have had experience with a few patients with hydrocephaly secondary to obstructive tumors and have encountered no complications. Although experience is extremely limited, I do not consider hydrocephalus a contraindication to the procedure.

In this clinic angiographic studies have been performed on 35 children, some of them bilateral. In only 1 instance was there any significant reaction. This occurred in a 10-year-old girl suspected of having a vascular malformation. Sixteen

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hours after the angiographic procedure hemiparesis developed, but cleared during the next three days. The hemiparesis was definitely not present at twelve hours. Although the reaction is unusual, it must be directly attributed to the procedure.

The technic I have used for the angiographic study of infants and children varies from that for adults only in direct exposure of the carotid artery. In general, no attempt is made to take percutaneous angiograms in children below the age of six or seven years. General anesthesia is used routinely. When the open technic is employed, the common carotid artery is exposed through a transverse incision just above the clavicle. A polyethylene tube into which a No. 19 needle fits is inserted into the artery and threaded upward for a short distance, care being taken that it does not pass far enough to enter the external carotid artery. The use of a polyethylene tube has several advantages. It minimizes manipulation and irritation of the artery, which in turn reduces the hazard of vasospasm. There is no danger of puncturing the posterior wall of the artery, either when the head is being manipulated or during injections. Finally, the use of a suitable length of tubing allows the surgeon's hands to be adequately removed from the direct roentgen beam.

During the past one and one-half years I have used 35 per cent Urokon rather than diodrast and have had no permanent reaction in either adults or children. Although this drug is perhaps less toxic than diodrast, it is by no means innocuous, and the same precautions should be taken in its use.

Injections are made of 5 to 10 cc. of 35 per cent Urokon, depending upon the size of the patient. The total cerebral blood flow per unit of time is much smaller in infants than in adults; therefore, a smaller volume of dye is required to produce adequate contrast visualization. Because of the cumulative effect of contrast mediums, it is advisable to allow ten to fifteen minutes between injections.

Serial pictures are extremely useful in the management of certain lesions, as will be shown later. As a routine I take six pictures, at intervals of half a second, to show the various phases of vascular filling.

The value of angiographic study for patients in the pediatric age group lies not only in its use as a diagnostic tool for diagnosing lesions similar to those which occur in adult practice—vascular abnormalities, tumors, hematomas, abscesses, etc.—but as a possible means of obtaining further information with regard to certain congenital lesions. I have arbitrarily chosen reports of illustrative cases to demonstrate the general selection of patients and the typical angiographic patterns, as well as to bring out a few points in angiographic diagnosis. In particular, cases are viewed which show the role angiography has played in diagnosis.

CASE 1.—In this case the characteristic picture of a space-taking lesion was present. The patient was a 10-year-old white boy. He had been treated for meningococcic meningitis, which responded promptly to therapy. Subsequently papilledema developed; the boy had an attack of grand mal and a left temporal focus was revealed by the electrocardiogram. Neurologic examination gave negative results. The arteriogram showed elevation of the middle cerebral artery and typical displacement by a lesion of the temporal lobe. The absence of tumor stain, although not diagnostic, is characteristic of an abscess, which was present in this boy.

Angiographic examination is probably a less hazardous method of demonstrating abscesses of the temporal lobe than are air studies. Air studies present some danger, because the expanded temporal lobe can exert pressure on the adjacent brain stem more easily than can an abscess in any other part of the hemisphere. Moreover, the hazard of rupture of the abscess into the ventricle, with reduction of intraventricular pressure, is obviated. For these

reasons, angiographic study is the procedure of choice when a lesion of the temporal lobe is suspected, and particularly if abscess is a possibility. Moreover, it is particularly useful and definitive in distinguishing cerebral abscess from other infectious processes, such as subdural or epidural empyema, lateral sinus thrombosis or cerebellar abscess.

It should be pointed out that the degree of shift of the middle cerebral artery does not indicate the size of the abscess, because of the zone of edema surrounding the actual purulent process. Also, the degree of lateral shift of the anterior cerebral artery depends largely on the position of the abscess within the temporal lobe and does not indicate the volume of the lesion or the urgency with which it should be treated.

CASE 2.—A 4½-year-old white boy had a history of lethargy, headache, vomiting and drooping of the right eyelid for two weeks. On admission there was total paralysis of the third nerve, and intracranial hypertension was present. The diagnostic impression, because of the ocular signs, was aneurysm or a subfrontal tumor. Arteriographic study showed characteristic displacement of the middle cerebral complex.

This pattern is characteristic of a mass lesion in the left frontal lobe, but again there is no tumor stain. The tumors which are most likely to produce a characteristic appearance are meningiomas and glioblastomas, both of which are relatively rare in pediatric age groups. Ependymomas and astrocytomas, the commonest supratentorial lesions in childhood, do not produce recognizable vascular patterns, and angiography is therefore of little value in making a preoperative histologic diagnosis. The tumor in this case was ependymoma which occupied the entire frontal lobe.

I do not consider the role of angiographic study significant in the diagnosis or evaluation of mass lesions in the posterior fossa. My experience with vertebral injection has been limited, because of my reluctance to subject my patients to this somewhat more difficult procedure, which seems to have little value.

CASE 3.—A third type of space-consuming lesion is demonstrated in this case. An 11-month-old infant had been apparently well until he reached the age of 4 months, when he had an illness of several days' duration, characterized by vomiting and finally culminating in Jacksonian seizures, for which he was hospitalized elsewhere. After that episode his development was extremely retarded, and it was noted that he apparently could not see. When first examined he was markedly retarded and blind, and the circumference of his head was only 41 cm. The opinion at that time was that thrombosis of the sagittal sinus had occurred during the original illness. Since the family wanted the problem investigated, air and angiographic studies were undertaken. The air study revealed excessive filling of the subarachnoid spaces in both frontoparietal areas, which was taken to represent "cerebral atrophy." The sinogram was normal, but the arteriogram showed a typical subdural hematoma in both frontal regions. The depression of cortical vessels away from the calvarium with no vascularity of the area itself is, of course, pathognomonic.

This case is of further interest in that at surgery there was no falx in the region of the hematoma, which was one continuous sac extending to both sides of the midline. Whether this represented a congenital absence of the falx or whether it was destroyed in some manner by the hematoma is purely conjectural.

This case has considerable speculative interest. The history was perfectly consistent with the classic descriptions of sinus thrombosis. It is curious that only 1 case has been reported in the literature, to my knowledge, in which occlusion of a sagittal sinus in an infant has been demonstrated sinographically. This was reported by Scott[4] of Philadelphia. Clinically, the patient was thought to have amyotonia congenita. Furthermore, Dr. Scott observed, in addition to the sinus thrombosis, bilateral subdural hydromas

which, he postulated, were secondary to the thrombosis. Bailey and Hass,[5] in a pathologic study, also noted hemorrhage into the meninges and subdural space associated with sinus thrombosis. The question is raised of the frequency with which subdural hematomas in infancy, when no history of trauma is obtained, is the result of sagittal thrombosis. In this case the small head and the marked cortical atrophy would appear to be consistent with diffuse cerebral damage from venous thrombosis.

This leads to problems that rest more clearly on a congenital basis.

CASE 4.—A 15-year-old boy was well until he was struck in the forehead with a baseball, and for four days had had no symptoms; then there were persistent severe occipital headaches, diplopia and bouts of vomiting. Neurologic examination gave entirely normal results, but pressure on lumbar puncture was consistently over 200 mm. The clinical diagnosis was subdural hematoma of unknown location.

Arteriographic study showed no shift of the midline vessels and no evidence of subdural hematoma. (The obvious abnormality here was the wide sweep of the anterior cerebral artery which characterizes hydrocephalus.) In addition, the lateral venogram showed slight depression of the venous angle, the point where the striothalamic vein makes a sharp turn backward and is joined by the septal vein; this is also associated with hydrocephalus. A ventriculogram showed the extent of hydrocephalus present. Exploration of the posterior fossa revealed no abnormality beyond lack of patency of the aqueduct. A Torkildsen procedure was done, and at the time of writing the boy has been asymptomatic more than three months.

The mechanism of this disorder is not clear, but there must have been congenital hypoplasia or subependymal gliosis of the aqueduct, which then became incompetent after the trauma. This case is reported to demonstrate the role played by angiographic study in the diagnosis and also as an example of the significance of the venous phase.

Included under congenital lesions are the arteriovenous malformations. The classic obvious arteriovenous fistula, which may occur anywhere in the brain, is well known and does not warrant further discussion. These lesions, however, are apparently similar to aneurysms in their growth with time, and they are therefore not always easy to recognize angiographically. Two cases have been selected that show the value of serial angiographic study in this condition—not only to demonstrate the lesion that may be missed in single pictures during the arterial phase but to show the arterial and venous supply.

CASE 5.—An 11-year-old boy was admitted to the hospital after a sudden intracranial hemorrhage accompanied by right hemiparesis. Arteriographic study was done a few days later. Two phases were observed, which were at least one second apart. In the first of these a normal vascular pattern was present; in the second there was a vascular stain in the parietal area. This would probably have been missed completely if a one-exposure method had been used. The next angiogram of the same patient demonstrated the value of serial films in showing the arterial supply and later the venous drainage. In this particular lesion both of these were toward the midline. The series of films also demonstrated that the lesions may appear only as a vascular blush in early life, although they apparently become more recognizable as a cluster of vessels later.

Some of these lesions undoubtedly completely obliterate themselves at the time of rupture. Thus, although they are potentially lethal, even in early life, it may be difficult to demonstrate them angiographically or even at postmortem examination.

CASE 6.—A boy aged 16, whose lesion was more easily recognizable, was admitted to the hospital after a sudden hemorrhage accompanied by hemiplegia. The arteriographic series again demonstrated the value of serial pictures. Evidence of intracerebral hematoma was observed by the downward displacement of the middle cerebral complex. Again the

actual malformation was not clearly visualized, but the venous drainage from it was evident. At operation a cluster of angiomatous microscopic vessels was observed at the point where the extensive intracerebral hematoma approached the surface of the cortex. The angiomatous mass had probably been partly destroyed in the process of rupture.

Arteriovenous malformations are responsible for nearly all the subarachnoid hemorrhages observed in children, which are fairly uncommon. In addition to hemorrhage, they may be responsible for focal seizures. The presence of repeated focal fits, especially if accompanied by a persistent electrocardiographic focus and normal results from air study, is a strong indication for angiographic investigation. Despite the congenital nature of the lesion, it uncommonly makes itself known in early childhood—rarely before the age of 10 years.

Allied to arteriovenous malformation are the various telangiectases, of which the so-called Sturge-Weber disease is one example. This condition is in essence a telangiectasis of the pia-arachnoid.

CASE 7.—A 12-year-old girl with a cutaneous hemangioma involving the first and second divisions of the trigeminal nerve was observed. She was mentally retarded, with right hemiparesis and jacksonian seizures. The plane films of the skull showed not only the classic intracranial opacities but the signs of unilateral cerebral hypoplasia, as evidenced by the asymmetry of the skull and the overdevelopment of the paranasal sinuses and mastoids on the involved side. The angiogram was, characteristically, not abnormal.

This disease is presumably an angiomatous malformation of the neural crest, which contributes not only to the meninges but to the mesodermal mesenchyme of the face. The opacifications observed are probably the result of degenerative changes in the cortex and are considered to exist on the basis of vascular stasis. The layers with the greatest metabolic activity are affected, namely, the ganglionic layers of the cortex. The term "calcification" has been avoided, as it has been shown by Lichtenstein and Rosenberg[6] that iron salts, rather than calcium, are actually present.

CASE 8.—A 6-month-old infant was suspected of having either toxoplasmosis or congenital cerebral vascular disease. Six cc. of diodrast was used, and the angiogram showed simultaneous filling of all major vessels of the brain. It was postulated by the radiologist that there may have been a temporary cardiac arrest to account for this filling. It seems unlikely that sufficient pressure could be or was exerted to fill all the major vessels against arterial pressure. This case is mentioned only as a curiosity; perhaps others have had this experience and understand its mechanism.

COMMENT

No new concepts have been presented in this report. It is simply a partial record of angiographic experiences at the Cincinnati General and Cincinnati Children's Hospitals. I have attempted to emphasize my conviction that, although angiographic study has its limitations in pediatrics, it is a relatively safe and valuable procedure. The incidence of complications is extremely low. Also, I have selected cases in which the role of angiographic investigation can be seen in the evaluation of both developmental and acquired diseases. Because of lack of space, sinus venographic study, which is also a valuable diagnostic procedure in certain cases, has not been discussed.

SUMMARY

The diagnostic use of angiographic investigation as applied to pediatrics has not been reported with any great frequency, probably because of the wide differences that exist between the neurosurgical diseases of infants and children and those of adults. On the other hand, it carries less hazard for children than for older pa-

tients. In the author's opinion, in addition to its diagnostic value, angiographic study is a possible means of obtaining new and needed information with regard to certain congenital lesions.

RIASSUNTO

L'impiego dell'angiografia in pediatria non è molto frequente, forse per le grandi differenze che esistono fra le malattie neurochirurgiche dell'infanzia e quelle dell'adulto.

Vi è, d'altra parte, minor rischio nei bambini che nei soggetti anziani. L'autore ritiene che, oltre al suo valore diagnostico, l'angiografia possa portare nuovi contributi alla conoscenza di certe lesioni congenite.

SUMARIO

O uso diagnóstico da investigação angiográfica conforme é aplicada na pediatria não tem sido relatada com grande frequência, provàvelmente por causa das grandes diferenças que existem entre as moléstias neurocirúrgicas de crianças pequeninas e maiores e aquelas dos adultos. Por outro lado, leva menos riscos para as crianças do que par os pacientes mais velhos. Na opinião do autor, em acréscimo ao seu valor diagnóstico, o estudo angiográfico é um meio possível de se obter informações novas e necessárias em rolação a certas lesões congênitas.

RÉSUMÉ

Il n'est pas souvent fait mention de l'examen angiographique en pédiatrie, sans doute du fait des grandes différences existant entre les affections neurochirurgicales du nourrisson et de l'enfant, et de l'adulte. Cet examen présente d'autre part moins de risques chez l'enfant que chez l'adulte. L'auteur pense qu'en plus de sa valeur de diagnostic l'examen angiographique fournit des indications nouvelles et précieuses sur certaines lésions congénitales.

ZUSAMMENFASSUNG

Es liegen nicht allzu viele Berichte über die diagnostische Verwendung der Angiographie in der Kinderheilkunde vor. Der Grund dafür liegt wahrscheinlich in der Tatsache, dass sich die neurochirurgischen Erkrankungen von Säuglingen und Kindern erheblich von denen Erwachsener unterscheiden. Andererseits ist die Angiographie an Kindern weniger gefährlich als an älteren Kranken. Der Verfasser weist darauf hin, dass die angiographische Untersuchung ausser ihrem diagnostischen Wert auch die Möglichkeit in sich trägt, neue und notwendige Informationen über gewisse angeborene Erkrankungen zu geben.

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Radium Therapy of Malignant Tumors of the Bladder

New Technic and Results

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HAVING previously reported my views on the treatment of malignant vesical tumors, I now present my results with surgical radium therapy in the treatment of these lesions. This paper will contain, as a matter of surgical interest, some new ideas on the subject, as well as the statistics thereon which I have prepared for presentation at the next meeting of the French Congress of Urology.

There are still urologists who, without experience in radium therapy, consider its efficiency limited to so-called favorable cases in which there is no extension of the lesion to the wall of the bladder. This is inaccurate, as I shall demonstrate its effectiveness by including data on serious malignant conditions treated with radium, often with remarkable results (Fig. 1). These tumors, without the help of radium, would have required total cystectomy.

Clinically and very simply, malignant tumors of the bladder can be classified into three varieties.

1. The type that exists in "favorable cases," without invasion of the submucosa.

2. A much more serious type, extensive and badly situated (around the ureteral orifices) and without mobility. Doubtless there is an early tendency toward infiltration of the vesical wall, and the histologic picture confirms this by showing the area to have been invaded to a greater or lesser extent.

3. A type that includes the most serious malignant lesions of all, those which have encroached upon one-third to one-half of the bladder, with repercussions upon the ureters and the renal cavities.

Having operated on more than 300 tumors of the bladder over the past twenty-five years, I should like to cite, for the sake of complete objectivity, 101 cases of such malignant tumors treated in the same clinic between 1942 and 1954 with the technic I have adopted and explained. Of the patients in these cases, 30 per cent had tumors of the highest degree of gravity (Category 3). Category 1 (20 cases) and Category 2 (50 cases) covered the remaining 70 per cent. The patients in the latter two categories were operated on with a genuine hope of recovery.

Considered statistically on the basis of the total, 101 cases, the series showed an operative mortality rate of 6 per cent.

At the time of writing, 83 per cent of the patients in Category 1 (the type with the most favorable prognosis) remain cured after five years and 84.5 per cent after three years.

In Category 2, which included 50 patients, 63.6 remain cured after five years

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and 67.4 after three years.

In Category 3, which included 31 patients with tumors of the worst possible prognosis, 10.5 per cent remain cured after five years and 8.5 after three years.

Statistics on the whole series of 101 cases, including those in all three categories, indicate that 48.5 per cent remain cured after five years and 52.5 per cent after three years. When a patient has survived three years he has the optimal chance of permanent cure.

It is to be noted that, although for Categories 1 and 2 the results are, on the whole, satisfactory, those in Category 3 are unfortunately not equally good. Let us then study in detail the types of tumor that proved extremely serious and try to arrive at an operating tactic that may perhaps enable the surgeon to obtain less disappointing results.

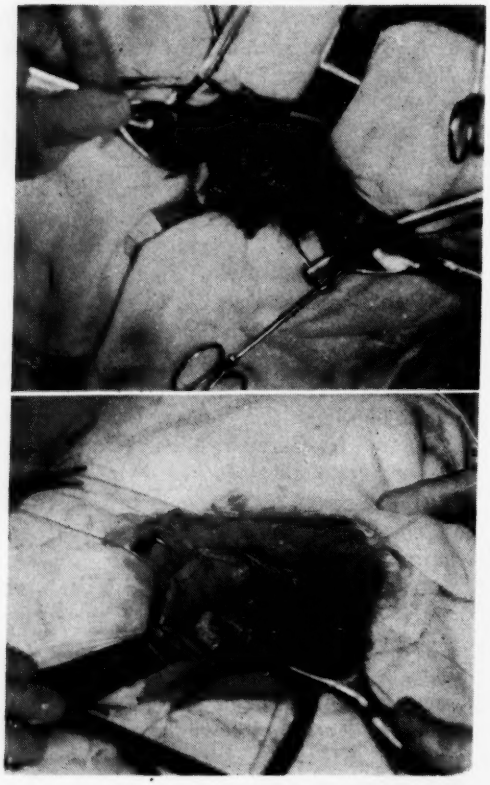

Fig. 1.—*Above*, extensive tumor treated with radium four years prior to the time of writing. *Below*, extensive tumor recently treated with radium.

Among the tumors in this third and worst category, two types can be distinguished: (a) those obviously and unmistakably serious, with grave repercussions on the urinary tract, and (b) those whose exact degree of seriousness was not foreseen, so that upon operation they prove to be far graver than had been suspected.

With the first group it is possible to consider in advance the principal problems involved: first, what to do with the ureters, and second, what to do with the tumor? The ureters must be diverted either to the intestine or to the skin. Ureterointestinal anastomosis requires a patient who is not totally exhausted and whose kidneys are still functioning. The problem of renal function is in itself most difficult and uncertain, particularly when one is dealing with silent kidneys, which may prove to be completely destroyed or merely "dormant." One then runs the double risk of diverting to the skin a ureter that deserves a better fate and, on the contrary, the risk of anastomosing to the intestine the ureter of a kidney whose function is utterly destroyed. To avoid these dangers, it is best to take a pyelogram after direct puncture to the exposed ureters, using a special radiologic operating table; an immediate estimate of the area level from the urine collected by ureteral puncture prior to the pyelographic study must not be neglected. With the information so obtained, one can select the best methods of treatment in the particular case.

If it is decided to divert the ureter to the intestine, my personal preference is for a laterolateral anastomosis. This offers a high degree of safety, to whatever degree the ureter may be dilated.

With regard to the tumor itself, certain surgeons consider total cystectomy necessary. This I regard as an excessive sacrifice for an old or elderly patient, and not infrequently even a younger patient refuses it. My own opinion is that total cystectomy should be performed as rarely as possible.

The solution I propose, then, for the treatment of extremely grave vesical neoplasms is as follows:

1. Preserve renal function, which is sooner or later lost, by a *systematic* deviation of urine. At the very least, a valuable palliative procedure will have been done.

2. Destroy neoplasms in Category 1 by performing a wide cystostomy and completely leveling the tumor by means of a diathermic loop, after which radium needles should always be implanted into the base of the tumor. For want of this complementary treatment I have often observed grave recurrences, appearing with a rapidity that proved the inability of histologic study to predict the actual degree of malignancy of a given tumor.

3. Treat tumors in Category 2 with radium therapy, which they imperatively demand. (I do not refer here to isotopes, which I have used but rarely, my experience with radium itself having been satisfactory.) Without radium, a total cystectomy would be necessary for such tumors. What a price this is to pay for an eventual cure that might have been obtained with radium, with preservation at least of the sexual and vesical functions!

Thanks to a technic continually improved, I have been able to extend the field of action of radium therapy. Technically, my customary practice is as follows:

1. The radium needles must be accurately placed; a wide cystostomy, therefore, is necessary. Before they are inserted, the tumor has been leveled as deeply as possible with the diathermic loop.

2. The radium needles must be kept in place throughout the period of radium therapy. This is best accomplished by reducing, as far as possible, the automatic physical contractions of the bladder, infiltrating the erigens and the pudendal nerves with procaine hydrochloride just before the operation is performed.

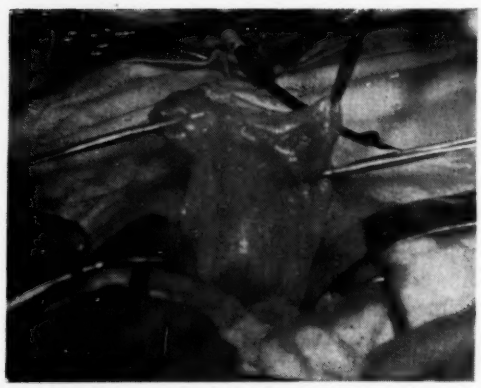

Fig. 2.—Deperitonized bladder drawn out through operative wound.

3. A special rubber balloon filled with a saturate solution of lead nitrate is placed close to the needles. This balloon prevents the needles from moving and acts as a screen against radiation.

4. The radium needles are left in place for three or four days, and a cystostomy is maintained for about four weeks in advance of closure of the bladder.

In the unceasing effort to continue improving the conditions of radium therapy, I recently hit upon a new technical detail that seems highly favorable: When the tumor is deeply placed and hard to expose, the bladder having a small capacity, "extraperitonization" of the bladder makes operating much easier (Fig. 2). Extraperitonization, which extends deeply below the base and the lateral facies of the bladder, permits intravesical and extravesical implantation of radium to be done simultaneously. I have no doubt that this would be of immense benefit to many patients with extremely severe vesical malignant disease, even some of those at the outer limits of effective radium therapy.

One can then envisage total destruction of the bladder by massive radium therapy.

Through a wide laparotomy I perform extraperitonization of the bladder and cleave deeply the posterior and lateral facets of the organ. In this way I am able to expose the ureter on each side at the level of the superior strait. If the conduits appear greatly enlarged and unhealthy, a bilateral cutaneous ureterostomy is performed and the ureters fixed side by side at the median line, which permits convenient collection of the urine. When, after all investigations, the condition of the kidneys and the ureters remain doubtful, a simple ureterostomy is performed on each ureter and a plastic ureteral sound of sufficient caliber is inserted and pushed up to the renal pelvis. This drainage is maintained as long as necessary, until one knows the exact condition of the kidneys and whether or not they are capable of improvement. The renal threat is thus avoided, and the surgeon is free to treat the neoplasm with total radium therapy, at the same time intravesical and extravesical. Some weeks later, being well informed as to the condition of the kidneys, he can select the type of deviation best adapted to the individual patient.

The simple ureterostomy will be replaced by either a cutaneous ureterostomy or a ureterointestinal anastomosis, according to what the renal condition seems to warrant.

These are my final conclusions as to the treatment of serious malignant tumors of the bladder, which confront modern surgeons with one of their most distressing problems.

SUMMARY

The author discusses the use of radium therapy for malignant tumors of the bladder. His experience does not confirm the theory that the efficiency of this form of treatment is necessarily limited to "favorable cases" in which the disease has not extended to the vesical walls. In his own practice he has extended its use with signal success. He describes his methods of using radium for vesical malignant tumors in three categories: (1) those that have not invaded the submucosa, (2) those which are much more serious and extensive and badly situated, e.g., around the ureteral orifice, and (3) the most serious of all, those encroaching on half of the vesical area, with disastrous effects on the ureters and the renal cavities.

Having operated on more than 300 vesical tumors in a period of twenty-five years, the author cites 101 which were treated by the method described, adding statistical data to demonstrate the high degree of favorable results.

RÉSUMÉ

L'auteur discute l'utilisation de la radiumthérapie dans le traitement des tumeurs malignes de la vessie. Son expérience ne confirme pas la théorie selon laquelle l'efficacité de cette méthode se limiterait nécessairement aux "cas favorables" où l'affection n'a pas atteint les parois vésicales. L'auteur a obtenu grâce à elle des résultats signalés. Il décrit ses méthodes de radiothérapie des tumeurs vésicales malignes qu'il divise en trois catégories: 1) celles qui n'ont pas envahi la sous-muqueuse, 2) celles, beaucoup plus graves et plus étendues et également mal situées, par exemple author des orifices urétraux, et 3) les plus sérieuses, celles qui empiètent sur la moitié de la surface vésicale, avec effets désastreux sur les uretères et les reins.

Ayant opéré plus de 300 tumeurs vésicales en 25 ans l'auteur cite 101 cas traités selon la méthode décrite; des données statistiques démontrent le pourcentage élevé de résultats favorables obtenus.

RIASSUNTO

L'autore descrive l'impiego della radiumterapia nella cura dei tumori maligni

della vescica. La sua esperienza non conferma la teoria che questo metodo di cura deve essere limitato ai casi favorevoli in cui il tumore non è diffuso alle pareti della vescica. Egli ne ha allargato l'impiego con successo e lo ha usato in tre categorie di tumori: 1) in quelli che non hanno invaso la sottomucosa; 2) in quelli più gravi ed estesi e anche mal situati, come per esempio attorno agli orifici ureterali; 3) nei più gravi di tutti, cioè quelli interessanti metà della parete vescicale con gravi ripercussioni sull'uretere e sulle cavità renali.

L'autore ha operato 300 tumori della vescica in 25 anni e ne ha trattati 101 col metodo descritto ottenendo favorevoli risultati.

ZUSAMMENFASSUNG

Der Verfasser erörtert die Radiumbehandlung bösartiger Geschwülste der Harnblase. Seine Erfahrungen können die Theorie, dass diese Behandlungsform nur in "günstigen Fällen," wo die Erkrankung noch nicht auf die Blasenwand übergegangen ist, wirksam sein kann, nicht bestätigen. Er hat in seiner eigenen Praxis die Radiumbehandlung mit bemerkenswertem Erfolg ausgeführt und beschreibt seine Methode der Anwendung bei bösartigen Blasengeschwülsten der folgenden drei Kategorien: 1. Geschwülste, die nicht in die Submukosa eingedrungen sind, 2. schwerere, ausgedehntere und ungünstig gelegene Geschwülste, z.B. in der Umgebung der Harnleitermündungen, und 3. die allerschwersten Formen, wo die Geschwulst die Hälfte der Blase umfasst, mit verheerendem Einfluss auf die Harnleiter und die Nierenbecken.

Der Verfasser hat in 25 Jahren über 300 Blasengeschwülste operiert und führt 101 Fälle an, die mit der von ihm beschriebenen Methode behandelt wurden. Die grosse Anzahl günstiger Ergebnisse wird an Hand von statistischen Angaben nachgewiesen.

SUMARIO

O autor discute o uso de radiumterapia para tumores malignos da bexiga. Sua experiência não confirma a teoria de que a eficiência desta forma de tratamento é necessecàriamente limitada aos "casos favoráveis" nos quais a moléstia não tenha se estendido às paredes vesicais. Um sua própria clínica estendeu seu uso com sucesso marcante. Descreve seus métodos no uso de radium para tumores malignos vesicais em três categorias: (1) os que não invadiram a submucosa, (2) aqueles muito mais graves e extensos e também mal situados, por exemplo, em redor dos orifícios ureterais, e (3) osmais graves de todos, os que tomam metade da área vesical, com efeitos disastrosos nos ureteres e cavidades renais.

Tendo operado mais de 300 tumores vesicais em um período de 25 anos, o autor cita 101 que foram tratados pelo método descrito, acrescentando dados estatísticos para demonstrar o alto gráu de resultados favoráveis.

Many men do not allow their principles to take root, but pull them up every now and then, as children do the flowers they have planted, to see if they are growing.

—*Longfellow*

The Concept of Grading Gliomas of the Central Nervous System

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THE classification of gliomas on the basis of cells of origin, and the division of the tumors thus formed by grades of malignancy, have been an outgrowth of the current understanding of the causation of tumors. Since there are only three types of adult glial cells, it would seem natural that there should be only three types of glioma, with varying degrees of malignancy depending on the histologic picture. A fourth type of tumor, the medulloblastoma, probably of embryonic cellular origin, must also be included because of its frequency. It was with this thought in mind that Kernohan and his associates[1] in 1949 published their paper on the grading of cerebral gliomas.

Since the dawn of history man has been fascinated by the growth of tumors. Their development was originally ascribed to malignant spiritual influences. Later, with the development of the Greek school of humoral pathology, neoplasms were considered to develop from excess of bodily secretions. The gradual shift to the current hypotheses has depended on the development of new instruments of precision and new experimental methods, and on man's genius in correlating the observations so obtained. Thus it was that, with the development of the microscope, Schwann,[2] in 1838, was able to develop the theory of the cell as the basis of living organisms, and Müller first demonstrated that tumors consist of cells, though it was his theory that the cells arose from an undifferentiated ground substance or blastema. Virchow, in 1858, stated his well-remembered dictum that tumors develop only from pre-existing cells, but fell into the error of believing that all malignant lesions develop from connective tissue; and it remained for his pupils to demonstrate that tumors could develop from other cells.

In the great age of morphologic pathology thus introduced, great strides were made in the description and classification of tumors of the human body. This work was aided in the latter half of the nineteenth century by the development of the aniline dyes used in staining histologic sections and by the perfection of the compound microscope, which together permitted the minute histologic description of innumerable tumors. The first major classification thus was a division into tumors of organoid growth, the carcinomas, and tumors of histoid growth, the sarcomas.

At the same time, speculation continued with regard to the etiologic factors in tumor formation. Even in the earliest years of the nineteenth century several hypothe-

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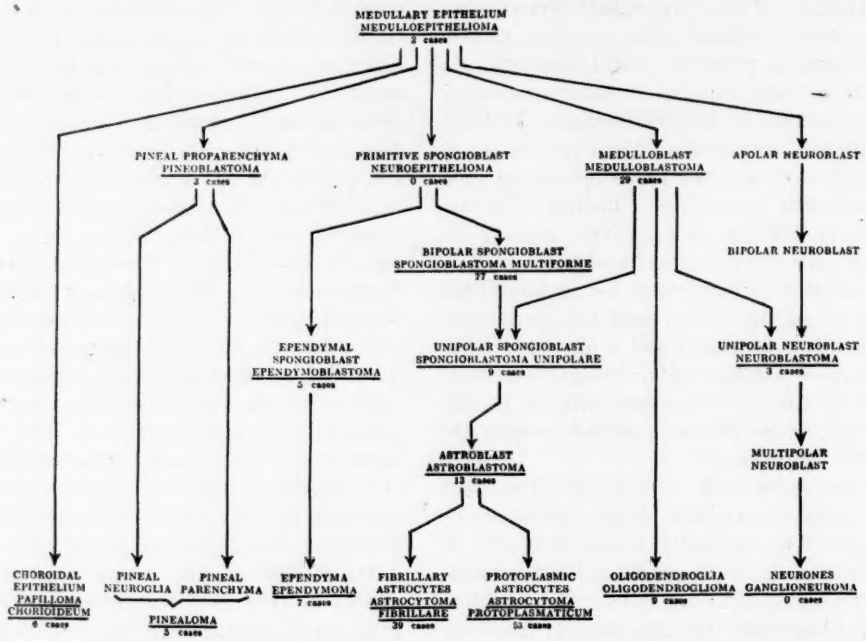
ses, many still in current usage, had been postulated. These included hypotheses that cancer resulted from a virus, developed from a primitive fluid blastema or lymph, or from misplaced embryonic cells, or was caused by specific trauma. In 1877 Cohnheim[3] formulated his hypothesis of the origin of tumors from misplaced embryonic cells or cell rests, basing it on the similarity of the morphologic picture of tumor cells to that of cells of the developing embryo (which were being described in detail at this time) and the occasional observation of misplaced embryonic cells in routine studies of histologic sections. Most of the classifications offered in the first half of the present century were based on this hypothesis.

In the early study of tumors of the central nervous system pathologists were hampered by difficulty in the staining of the cells, and, consequently, in understanding the relation of the cells. The rapidity of degeneration of the central nervous system after death and the general histologic complexity of the brain added to the problems, so that the general pathologists shied away from these studies and were content to classify tumors of the brain as gliosarcomas. The studies were continued only under great handicaps by those especially interested, the neurologists and psychiatrists, many of whom worked outside the general stream of pathologic philosophy. The usual stains available were not adequate to differentiate the cells, and the Golgi stains, the first to reveal the finer structure of the glial cells, were laborious, time-consuming and inexact. It was not until the early part of the present century, after publication of the work of Cajal, who used a modified Golgi technic, and his famous pupil, Del Rio Hortega, who used silver stains, that the morphologic riddle of the cells of the brain was solved.

Soon after this, a further stimulus for the detailed classification of brain tumors came with the development of neurosurgical technics. The necessity of classifying tumors detected by surgeons, so as to be able to give some practical advice as to the method of attack and as to the prognosis, soon became apparent. Thus it was that two neurosurgeons, Percival Bailey and Harvey Cushing,[4] published in 1926 their monograph, "A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis," the first logical classification of glial tumors of the central nervous system. Two themes run through this book: first, the relation of the histologic configuration of the tumors to the cells in the embryologic development of the brain; second and collaterally, the influence of the Cohnheim hypothesis of the origin of tumor from misplaced cell rests. Having reviewed the histogenesis of the central nervous system, they were able to chart the development of the cells and superimpose on this chart the tumors that most closely resembled the embryonic cell types. That Cohnheim's hypothesis could not explain the development of all gliomas they were well aware. This applied primarily to tumors of adult-appearing cells, with which the hypothesis of Samuel was evoked: that cells of least specialized functional differentiation most easily assume neoplastic traits. The problem of the origin of the spongioblastoma multiforme was further discussed because the investigators had noted, as had others before them, that multiple biopsies seemed to indicate increasing alterations of the tumors from protoplasmic astrocytomas to spongioblastomas. Here they mentioned that a dedifferentiation seems to have occurred with a corresponding increase in the rapidity of growth.

At the time of the publication of this monograph, two other lines of cancer investigation were being pressed. Pott,[5] in 1775, had noticed the prevalence of cancer of the scrotum among chimney sweeps. It

TABLE 1.—*Bailey and Cushing's Classification of Types of Glioma**



*Reproduced with permission from Bailey, Percival, and Cushing, Harvey: A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis. Philadelphia: The J. B. Lippincott Company, 1926.

was not till the beginning of the twentieth century that further studies of artificial tumor production were undertaken on a large scale, based on the ability of tar and its fractions to act as carcinogenic agents; the first large contributions began to appear in 1925, under the direction of Kennaway.[6] Later it was determined that, by the use of suitable agents, tumors could be produced in nearly all tissues, though with varying degrees of frequency. As the result of these studies it has been generally accepted that tumors develop from preexisting adult normal cells through some change, as yet unknown, produced by the carcinogenic agent. Whether this change occurs in a single cell, as described by Sutton, or develops in a whole area or field, as postulated by Willis,[7] has not been settled, and both mechanisms may operate.

Early work on chemical carcinogenesis was limited at first to the skin and only later expanded to include the internal organs. In 1939, Seligman, Shear and Alexander[8] were able to produce brain tumors by this method. Using similar technics, Zimmerman and Arnold,[9] in 1941, developed tumors classified by them as astrocytoma, glioblastoma multiforme, medulloblastoma, oligodendroglioma and spongioblastoma, as well as several unclassified gliomas. The histologic type of tumor appeared to depend on the location of the carcinogenic pellet in the brain and the corresponding type of cell stimulated. As the result of these studies, the hypothesis of Cohnheim that brain tumors develop from immature cell rests no longer plays a dominant part in the theory of their origin; rather, the theory that these tumors

likewise develop from pre-existing adult cells as the result of some stimulus is now coming to the fore. That certain tumors, usually observed in infants and children, do develop from cells as yet undifferentiated, but by the same process, has not been denied.

The other concurrent development occurred as the result of the surgeon's desire to have some idea as to the degree of malignancy of any one particular tumor. Broders,[10] in 1920, reporting on a study of 535 cases of carcinoma of the lip, divided the carcinomas, on histologic grounds alone, into four groups or grades, based on the degree of anaplasia of the cells in the tumor. He followed Hausemann's suggestion, formulated in the 1870's, that tumors develop by anaplasia or dedifferentiation of mature cells, and he classified the tumors according to the percentage of cells that were mature or differentiated. If between 75 and 100 per cent of the cells were differentiated, the tumor was Grade 1; between 50 and 75 per cent, Grade 2, and so forth, using the generic name of the mature tissue for the suffix to the grade. In 1926[11] he was more precise in defining undifferentiated cells, classifying cells that were in mitosis or had prominent nucleoli as undifferentiated cells, and, using the same percentile figures, divided the tumors thus studied into grades.

After making his histologic classification, Broders studied the postoperative results and noted that, in general, patients with tumors of Grade 1 malignancy had fewer metastases and lived longer than did patients with tumors of Grade 2 malignancy. Similarly, the figures for Grade 2 were better than for Grade 3, and those for Grade 3 were better than those for Grade 4. Not only did this system apply to cancers of epithelial origin, as originally described, but, through use of the same method of grading, similar prognostic evaluation was successful for the other groups of tumors studied, so that the method has a universal statistical application.

Unfortunately, many misunderstandings have developed concerning Broders' classification. The classification is based on the histologic appearance of the cells, no matter what their origin, so that there is

TABLE 2.—*Kernohan's Classification of Gliomas, Modified**

New	*Old Term, with New in Parentheses*
Astrocytoma, Grades 1 to 4	Astrocytoma (astrocytoma, Grade 1) Astroblastoma (astrocytoma, Grade 2) Polar spongioblastoma (obsolete) Glioblastoma multiforme (astrocytoma, Grades 3 and 4)
Ependymoma, Grades 1 to 4	Ependymoma (ependymoma, Grade 1) Ependymoblastoma (ependymoma, Grades 2 to 4) Neuroepithelioma (obsolete) Medulloepithelioma (ependymoma, Grade 4)
Oligodendroglioma, Grades 1 to 4	Oligodendroglioma (oligodendroglioma, Grade 1) Oligogodendroblastoma (oligodendroblastoma, Grades 2 to 4)
Medulloblastoma	Medulloblastoma
Neuroastrocytoma, Grades 1 to 4	Ganglioneuroma, Gangliocytoma, Ganglioglioma } (neuroastrocytoma, Grade 1)
	Spongioneuroblastoma, Glioneuroblastoma and others } (neuroastrocytoma, Grades 2 to 4)

*Reprinted with permission from Adson and Svien, Rocky Mountain M. J. 45:962-968 (Nov.) 1948.

TABLE 3.—*Classification of Gliomas*

Ependyma	Astrocyte	Oligodendroglia	Neuron
↓	↓	↓	↓
Ependymoma	Astrocytoma	Oligodendroglioma	Ganglioneuroma
Grade 1	Grade 1	Grade 1	Grade 1
Grade 2	Grade 2	Grade 2	Grade 2
Grade 3	Grade 3	Grade 3	Grade 3
Grade 4	Grade 4	Grade 4	Grade 4

Medulloblast?

↓

Medulloblastoma

no relation between the grade of the tumor and its frequency; thus, most carcinomas of the stomach are Grades 3 and 4, while most carcinomas of the rectum are Grades 1 and 2, and the corresponding prognosis is found in approximately that proportion. Naturally, the grade of the tumor has nothing to do with the surgical hazards involved, and the prognostic significance depends on successful recovery of the patient from the operation. Similarly, it must be recognized that the pathologist can grade only that portion of the tissue which is sent to him by the surgeon, and if this is not representative of the growth the grading may be in error. Broders, realizing that not all parts of a tumor are similar in every case, warned investigators that the grade should depend on the most malignant part of the tumor. It has always been of interest that many workers who object to Broders' four grades are quite willing, as is Willis, to state that a tumor is slightly malignant, malignant or very malignant; a grouping that is really a division into three grades and is based more on the subjective opinion and experience of the individual pathologist than on the more rational classification of Broders.

Since Broders' classification first appeared in 1920 and the basis for the grading of tumors in general had been well established by 1940, why then was grading of brain tumors not proposed until 1949? Several factors appear to have played a part. First of all, large series of gliomas had not been operated on and tissue was not available for histologic study to provide adequate statistical evidence of the validity of grading as a prognostic tool. Second, the Cohnheim hypothesis, with its emphasis on the development of brain tumors from cell rests, and, with it, the consequent belief in the individuality of each type of tumor, was still widely held. Third, neurosurgery was a highly specialized field, with practice confined to a few centers where the neurosurgeon did his own neuropathologic studies or worked closely with a few dedicated persons, so that the complicated classification of the past was not too important.

More important than any of these, how-

ever, was the gradual realization that division of the tumors into special classes because of the presence of one cellular pattern was highly artificial. This was noted particularly in the study of the astrocytoma, astroblastoma, spongioblastoma polare and glioblastoma multiforme. Throughout this group of tumors the one persistent type of cell is the astrocyte, with greater or lesser numbers of modified tumor astrocytic cells. Russell and Bland[12] had already pointed out that the cells of the commonly designated spongioblastoma polare grow in tissue cultures as astrocytes and observed that the cells acquire their peculiar shape by their location between the compressing action of the parallel-running heavy axis cylinders in the brain stem, corpus callosum and internal capsule, their sites of predilection. In the glioblastoma multiforme all varieties of cells can be found, from swollen astrocytes to bizarre astrocytic forms, but many of these can be found duplicated around infarcts and other areas of cerebral trauma. In other words, the similarities within this group of tumors, on closer study, are greater than the differences. Similar studies of the ependymoma and oligodendroglioma groups lead to the same conclusion.

Finally, about this time, there appeared a need for a classification understandable both to the growing number of younger neurosurgeons and to their associates, the general pathologists. Thus it was that a study of grading of astrocytomas and ependymomas was undertaken by Kernohan, Mabon, Svien and Adson,[1] which laid the basis for the grading of cerebral gliomas.

It seems pertinent at this point to review the classifications proposed by Bailey and Cushing and those proposed by Kernohan (Tables 1 and 2). As can be seen from Table 2, Kernohan formalized the suggestion previously made by Bailey and Cushing as to the similarity of the astrocytomas, astroblastomas and glioblastomas as part of a group of tumors known as astrocytomas, and divided them simply into Grades 1 to 4. Similarly, he brought together the ependymomas and ependymoblastomas and included with them the more dedifferentiated medulloepitheliomas. The oligodendrogliomas are a smaller and less well-defined group, often mixed with astrocytes and ependymal cells, both normal and tumor cells, and probably are rarely to be recognized in the higher grades. No attempt has been made to alter the classification of the medulloblastomas. Knowledge concerning these tumors is still incomplete, though they appear to develop from an embryonic cell in the course of development of the external granular layer of the cerebellum, a proposition which is as yet unproved. As for the neuroastrocytoma, considerable differences of opinion exist as to whether this is a distinct pathologic entity within the central nervous system. Certainly in the great majority of cases the neurons are misplaced in the growing tumor or are large astrocytes mistaken for tumor neurons, so that, the astrocyte being the important cell, the tumors are best classified on the degree of dedifferentiation of the astrocyte.

To make the position of the Kernohan classification clearer, it might be well to present it in another form, more closely resembling that of Bailey and Cushing (Table 3). It should be pointed out that it is not assumed that the higher-grade tumors pass through phases of increasing malignancy, as might be assumed by the placing of the terms. Though changes in the grade of malignancy have been observed in multiple operations on the same tumor, it appears that in the great majority of cases tumors develop and continue to grow in the same manner throughout the period of their natural history.

Finally, as with any classification of tumors, it must be admitted that certain tumors do not seem to fit the classification.

Usually these are tumors occurring in infants or young children, and the probability is that the tumor developed from cells before the nervous system had completely developed. Many of these tumors take on the appearance of (a) teratomatous growths or (b) hamartomas.

In conclusion, the grading of gliomas of the central nervous system brings these tumors into line with current theories as to the development and course of tumors of the remainder of the human body and emphasizes the unity of pathologic processes, no matter where they occur.

SUMMARY

The author traces the history of the classification of malignant tumors from the early work of Schwann and Müller down to and beyond Broders' famous classification. His conclusion is that the grading of gliomas of the central nervous system brings these tumors into line with current theories as to the development and course of tumors in other parts of the human body and emphasizes the unity, so to speak, of all pathologic processes wherever they may occur.

RÉSUMÉ

L'auteur fait l'historique de la classification des tumeurs malignes, depuis les travaux de Schwann et Muller jusqu'à la classification mémorable de Broder. Il en conclut que la classification des gliomes du système nerveux central est conforme aux théories admises sur le développement et l'évolution des tumeurs dans d'autres organes, et il souligne l'unité de tous les processus pathologiques à quelque niveau qu'ils se situent.

SUMARIO

O autor traça a história da classificação dos tumores malignos desde o primeiro trabalho de Schwann e Muller até a famosa classificação de Broder e além da mesma. Sua conclusão é a de que o classificação dos gliomas do sistema nervoso central traz êsses tumores de acôrdo com as teorias correntes quanto ao desenvolvimento e curso dos tumores em outras partes do corpo humano e salienta a unidade, por assim dizer de todos os processos patológicos aonde quer que possam ocorrer.

RIASSUNTO

L'autore traccia la storia della classificazione dei tumori maligni, dai primi lavori di Schwann e Muller fino alla famosa classificazione di Broder e oltre.

Egli conclude che la posizione dei gliomi del sistema nervoso centrale è tale da porre tali tumori sulla stessa linea dei tumori di altre parti del corpo e sostiene un concetto unitario per tutti i processi patologici, dovunque essi occorrano.

ZUSAMMENFASSUNG

Der Verfasser verfolgt die Geschichte der Klassifizierung bösartiger Geschwülste, beginnend mit den frühen Arbeiten von Schwann und Müller bis zu der berühmten Einteilung von Broder und darüber hinaus. Er kommt zu der Schlussfolgerung, dass durch die Gruppierung der Gliome des Zentralnervensystems diese Geschwülste mit den bestehenden Theorien über die Entwicklung und den Verlauf von Geschwülsten anderer Körperteile des Menschen in Einklang gebracht werden und hebt die Einheit sozusagen allen pathologischen Geschehens, wo immer es sich abspielen möge, hervor.

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Freedom is not what a man does, nor what he is permitted to do. Freedom is part of what a man is.

—Lessing

A great deal of the joy of life consists in doing perfectly, or at least to the best of one's ability, everything which one attempts to do. There is a sense of satisfaction, a pride in surveying such work, a work which is rounded, full, exact, complete in all its parts—which the superficial man, who leaves his work in a slovenly, slipshod, half-finished condition can never know. It is this conscientious completeness which turns work into art. The smallest thing, well done, becomes artistic.

—Matthews

Unless we can and do constantly seek and find ways and means to do a better job; unless we accept the challenge of the changing times; we have no right to survive and we shall not survive.

—Fischer

Obstetric and Gynecologic Surgery

Cesarean Sections in a General Hospital

A Survey: January 1951 - December 1955

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ST. LUKE's Hospital in New Bedford, Massachusetts, is a general hospital, serving a city of approximately 108,000 people. In addition, 50,000 people in surrounding towns are serviced by the hospital. It is the only one in the city. The bed capacity is 423, of which 46 are obstetric beds. There are 55 bassinets. All premature babies are now housed on the obstetric floor and cared for by members of the obstetric nursing staff.

The staff of the hospital is composed of surgeons, internists, specialists in the various fields, and general practitioners who have privileges varying with their particular training, skill and ability. Twenty-nine years ago, when I first started the practice of obstetrics and gynecology, privileges in obstetrics were given to any licensed physician who was a graduate of an accepted school, the one exception being that cesarean section could be done only by physicians qualified in surgery. The result of this was that nothing but classic cesarean sections were done. Many years passed before a department of obstetrics was formed and the surgeons reluctantly gave up the performance of cesareans. Even today there are a few hangovers of this period.

During the same era, many deliveries were accomplished at home, a fair percentage by midwives. Prenatal care was poor or nonexistent, and complications were many and serious. Ward service in this hospital was heavy and consisted for the most part of cases too difficult to handle at the patient's home. Today, nearly all deliveries in the city are done at the hospital. Practically all patients are given adequate prenatal care. Ward patients are few, although the number in the Prenatal Clinic is now increasing. Into the hospital family have been absorbed most of the graduates of substandard schools who have been in the area for many years; they are given limited privileges under supervision, including limited obstetric privileges. The result has been a remarkable increase in their knowledge and skill.

When I first started practice, the obstetrics department was part of the medical and pediatric department. Today it is a separate department with seven full-time obstetric specialists, either diplomates of the American Board or qualified for the Board. These men have major obstetric privileges. All others, with a very few exceptions (these being older men who have had major privileges for many years) are limited to minor obstetrics. Minor obstetrics is defined as normal and low forceps deliveries with or without episiotomy, repair of simple laceration, etc. In compli-

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TABLE 1.—*Indications for Section*

	1951	1952	1953	1954	1955
Repeat	56	57	64	67	87
Cephalopelvic disproportion	16	34	55	38	37
Premature separation of placenta	16	18	12	8	13
Placenta praevia	11	16	10	12	5
Dystocia	7	7	7	10	8
Uterine inertia	9	15	11	11	
Toxemia not responding to treatment	8	4	13	14	8
Fetal distress	5	5	5	2	7
Prolapsed cord					1
Primiparous breech	2	2			2
Elderly primipara					2
Bandl's ring constriction					2
Fibroid uterus	1	2	1	1	1
Diabetes	1	1	1	1	2
RH factor, erythroblastosis					1
Cardiac decompensation			1		
Abdominal pregnancy	1		1		
Cancer of breast					1
Severe hypertension		2			1
Pelvic tumor		2			1

cated cases, men who have minor privileges must consult with a member of the Obstetrical Staff, this being done without a fee if the particular member selected happens to be on ward service at the time. If delivery by this consultant is requested, a fee may be charged in such cases as make it advisable. The cases of all women requiring cesarean section, whether they are the patients of men with minor privileges or of those with major privileges, require consultations and are thoroughly reviewed at the regular monthly meetings of the department. In my opinion, the statistics presented in the accompanying tables show the wisdom of these requirements.

Table 1 is a list of the indications for section. As one would expect, the most common indication after repeat section is cephalopelvic disproportion. Not all patients undergo roentgen pelvimetric studies, but an increasing number do. The radiologist uses the Colcher-Sussman method. Soft tissue roentgenograms are used to determine the position of the placenta. There is, however, a considerable degree of error, and obstetric experience and judgment have not yet been replaced by the discoveries of Professor Roentgen.

Table 2 shows the five-year totals from January 1951 through December 1955. Broken down, the figures show a gradual decrease in the number of primary sections and an increase in the number of repeat sections, which is to be expected. My department has no formal rule concerning the matter. It is obviously the consensus that once a patient has under-

TABLE 2.—*Five-Year Totals*

	1951	1952	1953	1954	1955
Total deliveries	2,050	2,074	2,034	2,169	2,444
Cesarean (total)	163 = 7.9%	166 = 8%	182 = 8.4%	164 = 7.5%	179 = 7.2%
Total primary	107 = 5.2%	109 = 5.2%	118 = 5.8%	97 = 4.4%	92 = 3.7%
Repeat (total)	56 = 2.7%	57 = 2.8%	64 = 2.6%	67 = 3.1%	87 = 3.5%

Five-year average: Deliveries—10,771

Total percentage of primary sections	4.9%
Total percentage of repeat sections	3.0%
Total percentage	7.9%

gone cesarean section the same is usually done in subsequent deliveries. There are, to be sure, some exceptions.

In suspected cases of placenta praevia, a double set-up is used, and the examination is done in the obstetric operating room, with adequate blood at hand for replacement and all measures taken to do an immediate section if necessary. There is an adequate supply of fibrinogen in the delivery suite at all times.

It should be noted that in 1955 no cesareans were done for uterine inertia, perhaps because of the wider use of intravenous pitocin drip under the constant supervision of the attending obstetrician. By "constant supervision" I mean that the attending obstetrician must sit constantly beside the patient's bed, so that there will be no complications as a result of intravenous administration of pitocin. No cesareans were done for tuberculosis during this period of five years, in contradistinction to the picture some years ago, and only 1 cesarean was performed for probable fetal erythroblastosis. I agree that the mortality rate of prematurity is probably as great as that of erythroblastosis or greater, particularly since our pediatricians are capable of doing replacement transfusions and see the baby as soon as it is born. Only 1 patient with cardiac disease underwent section, which is in contradistinction to the practice some years ago. In 1 case of abdominal pregnancy the fetus was dead but the mother survived. In the other case of abdominal pregnancy a living baby was delivered and the mother died. She had pneumonia and was operated on with general anesthesia (oxygen and ether), although the obstetrician had requested spinal anesthesia.

In the five-year period there were 3 deaths in the hospital, all occurring in 1951. They are as follows: A patient with mitral stenosis and cardiac decompensation was delivered normally and died a few hours later of acute pulmonary edema in spite of all treatment. A second death was due to shock and hemorrhage from a complete separation of the placenta. The patient in this case was given blood transfusion and supportive treatment and placed on the operating table; an incision was made in the abdomen and in the uterus, but she died on the operating table from shock. The third death, not a "cesarean death," was that of a patient with puerperal inversion of the uterus. This patient went into deep shock, was treated with blood transfusions and other supportive measures but failed to respond. The abdomen was opened and the inversion reduced by the Irving technic, in spite of which the patient died a few hours later. Her death is therefore included in the hospital mortality statistics but not as due to cesarean section. In this entire series, therefore, there was only 1 death attributable to this cause, and the patient concerned was almost moribund when she arrived at the hospital. Since 1951 there have been no maternal deaths from any cause. The anesthesia of choice in the majority of cases is spinal, with hyperbaric pontocaine. In some cases the gas, oxygen and ether mixture is given, and in an occasional case local anesthesia is employed. Patients are ambulant on the day after the operation, and the average stay in the hospital is seven days, whereas the average stay in the hospital for patients delivered otherwise than by cesarean section is about three and one-half days. Since adoption of the routine policy of getting patients out of bed as soon as possible after delivery, regardless of the type, the incidence of thrombophlebitis and phlebothrombosis has decidedly decreased.

In this series there were 20 stillbirths among the deliveries by cesarean section, all due to premature separation of the placenta. In addition, a number of premature babies were delivered, usually in cases of placenta praevia, and these were born alive.

SUMMARY

A series of cesarean sections performed in a general hospital between Dec. 1, 1951, and Dec. 31, 1952, is presented. Of a total of 10,771 deliveries, 854 were accomplished by cesarean section, an incidence of 7.9 per cent. Of these, 4.9 per cent were primary and 3 per cent "repeats."

The indications for cesarean section are tabulated with repeat cesarean and cephalopelvic disproportion accounting for the majority.

CONCLUSIONS

At St. Luke's Hospital of New Bedford, Massachusetts, a general hospital, the mortality rate for cesarean section has been brought to the irreducible minimum of zero. The author attributes this to the following factors:

1. The department of obstetrics is staffed with full-time obstetric specialists, qualified by the American Board of Obstetrics or diplomates thereof.

2. Consultation is required before any cesarean section is performed.

3. Hospital staff members who have minor obstetric privileges are required to obtain consultation if any complication arises.

There is a gradual decrease in the number of primary cesarean sections performed in this hospital. The number of "repeat" sections performed is increasing to approximately the same extent.

RÉSUMÉ

Une série de césariennes pratiquées du ler décembre 1951 au 31 décembre 1952 est présentée. Sur un total de 10.771 accouchements, 854 ont été faits par césarienne, soit 7,9%, sur lesquels 4,9% étaient des césariennes premières et 3% des césariennes répétées.

CONCLUSIONS

A l'Hôpital général de St. Luke, New Bedford, Massachusetts, le pourcentage de mortalité de la césarienne a été abaissé au taux irréductible de 0, que l'auteur attribue aux facteurs suivants:

1. Le service d'obstétrique est équipé de spécialistes ayant les qualités requises par l'American Board of Obstetrics, qui y travaillent à plein temps.

2. Une consultation est requise avant toute césarienne.

3. Les membres de l'équipe médicale à prérogatives mineures en obstétrique doivent demander une consultation à la moindre complication.

Le nombre des césariennes premières diminue progressivement à l'Hôpital St. Luke. Celui des césariennes répétées est en augmentation à peu près proportionnelle.

RIASSUNTO

Viene presentata una serie di tagli cesarei eseguiti in un ospedale generale fra il dicembre del 1951 e il dicembre del 1952. Su 10.771 parti, 854 furono i tagli cesarei, con una frequenza del 7,9%. Di questi il 4,9% erano primitivi e il 3% ripetuti.

Vengono elencate le indicazioni.

CONCLUSIONI

Al St. Luke's Hospital di New Bedford, Massachusetts, la mortalità per tagli cesarei è stata nulla. Le ragioni di questo fatto sono le seguenti:

1. Il reparto ostetrico è servito da ostetriche specializzate a pieno servizio, diplomate all'American Board of Obstetrics.

2. Viene fatto un consulto prima di eseguire qualunque cesareo.

3. Il resto del personale è invitato a richiedere una consulenza qualunque complicazione si presenti.

Il numero dei tagli cesarei primari tende a diminuire; in quasi ugual misura cresce, invece, il numero dei tagli cesarei ripetuti.

ZUSAMMENFASSUNG

Es wird über eine Serie von Kaiserschnitten, die vom 1. Dezember 1951 bis zum 31. Dezember 1952 in einem allgemeinen Krankenhaus ausgeführt wurden, berichtet. Bei einer Gesamtzahl von 10771 Entbindungen kam es zu 854 Kaiserschnitten, was einer Häufigkeit von 7,9% entspricht. 4,9% waren erstmalige Kaiserschnitte, und 3% wiederholte.

Die Indikationen für die Kaiserschnitte werden in Tabellenform angegeben. Vorangegangene Kaiserschnitte und Missverhältnis zwischen Grösse des kindlichen Kopfes und des mütterlichen Beckens bildeten die Gründe für die Operation in der Mehrzahl der Fälle.

SCHLUSSFOLGERUNGEN

Die Sterblichkeitsquote beim Kaiserschnitt ist im St. Luke's Hospital in New Bedford, Massachusetts, einem allegmeinen Krankenhaus, auf das Minimum von null herabgesunken. Der Verfasser schreibt diese Tatsache den folgenden Umständen zu:

1. Der Ärztestab der geburtschilflichen Abteilung setzt sich aus ganztägig beschäftigten Geburtshelfern zusammen, die vom American Bord of Obstetrics als Spezialisten anerkannt sind.

2. Vor jeder Ausführung eines Kaiserschnittes muss eine Konsultation erfolgen.

3. Ärzte, die am Hospital arbeiten und keine umfangreiche geburtshilfliche Erfahrung haben, müssen mit dem Spezialisten konsultieren, sowie irgendwelche Komplikationen auftreten.

Die Zahl der erstmaligen Kaiserschnitte nimmt in diesem Hospital allmählich ab, während die Zahl der "wiederholten" Kaiserschnitte etwa in gleichem Umfange wächst.

SUMARIO

Uma série de secções cezarianas feitas em um hospital geral entre 1 de dezembro de 1951 e 31 de dezembro de 1952, é apresentada. De um total de 10,771 partos, 854 foram feitos por cezariana, uma incidência de 7.9%. Destas, 4.9% foram primárias o 3% "repetidos."

As indicações para a secção cezariana são tabuladas com cezarianas repetidas sendo a desproporção cefalopélvica responsável pela maioria.

CONCLUSOES

No Hospital St. Luke em New Bedford, Massachusetts, hospital geral, a média de mortalidade na cezariana foi reduzido para zero. O autor atribui tal fato aos seguintes fatores:

1. O departamento de obstetricia conta com especialistas obstétricos, qualificados pelo American Board of Obstetrics ou diplomados de lá.

2. Exige-se consulta antes que se faça qualquer cezariana.

3. Os membros do "staff" do hospital que tem previlégios obstétricos menores são obrigados a fazer consulta no caso de surgirem complicações.

Há uma diminuição gradual no numéro de cezarianas primárias feitas no hospital. O número de secções "repetidas" feitas está aumentando aproximadamente para o mesmo número.

Dysmenorrhea

A Clinical Study

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IT is not my intention to try to solve the problem of functional dysmenorrhea. The sole object of this article is to present a study of 200 cases, based on clinical observation.

Functional dysmenorrhea is a complex subject; to study it one must first eliminate all organic lesions, a difficult task and one in which a high percentage of error is to be expected. This necessary preliminary phase accomplished, it is essential to distinguish three major varieties of functional dysmenorrhea:

1. Functional dysmenorrhea *per se*, i.e., true disturbance of the menstrual phenomena.

2. Functional dysmenorrhea of psychogenic origin.

3. Pseudodysmenorrhea, with which extragenital pain is aggravated during the menses.

The physiologic aspects of menstruation need not be discussed here. One should remember, however, that progesterone and corpus luteum are prerequisite to functional dysmenorrhea. To this, few supplementary considerations need be added.

I. If anovulatory cycles are occasionally (rarely) painful, this is due to one or another, or to several, of the following causes:

1. A thin uterine mucosa, with minimal fragments to be eliminated.

2. A diminished degree of uterine congestion.

3. Uterine contractions that are smaller than usual and may even be fibrillating.

4. Menstrual debris and blood of lower toxicity than is usual.

II. When one studies functional dysmenorrhea, one quickly realizes that none of the currently accepted and propounded theories is applicable in all cases of functional dysmenorrhea and that clinical judgment, as always, is the best guide to their pathogenesis. As a matter of fact, this clinical entity presents itself under a variety of pictures, each with a different cause; for example, obstructive dysmenorrhea, with which there is an obstacle to the menstrual flux during the first few hours of menstruation cannot have the same cause as nonobstructive dysmenorrhea, in the presence of which there is no barrier to the flow.

I have used this concept of obstruction as a basis for division in my study of functional dysmenorrhea. Thus, I suggest two categories: (a) obstructive functional dysmenorrhea and (b) nonobstructive functional dysmenorrhea.

Obstructive Functional Dysmenorrhea.—MacIntosh, a century ago, said: "*Nulla dysmenorrhea nisi obstructiva.*" Since then, numerous theories have been advanced. Today, many authors reject the theory of obstruction and try to explain functional dysmenorrhea by a phenomenon of "vasoconstriction." It is pure illusion to group all types of functional dysmenorrhea under this one heading. Some types are due to vasomotor crises and curable by vasodilators, but there is also an obstructive type with which there exists a barrier to the flow and the pain disappears when the flow begins. On this

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type the vasodilators have no effect. Such "obstructive functional dysmenorrhea" can be distinguished from obstructive organic dysmenorrhea (cervical stenosis) by the fact that the pain is not always the same, being lessened by rest, exercise, etc.

Since the pain is visceral, it is difficult to localize. The patient usually complains of hypogastric pain. A unilateral pain is usually organic.

What then, are the causes of obstructive functional dysmenorrhea? The following suggestions have been advanced:

1. *Uterine debris:* It is known that the uterine mucosa is much thicker when ovulation has taken place than when the cycle has been anovulatory. It is possible that the cervix could be obliterated by large mucosal fragments, for every gynecologist knows the type of dysmenorrhea commonly known as membranous, with which the uterine mucosa is expelled *in toto*. This classic form, however, is rare. One is more likely to encounter the exfoliative type, with which the mucosa is expelled in large fragments. I have never encountered any modification of the uterine mucosa in the few cases of this type of dysmenorrhea that I have observed.

2. *Bloddy clots and uterine distention:* Many patients state that they have violent pains until they have passed a clot, which phenomenon may be repeated many times during menstruation. Most of these women notice, at the same time, modifications in the menstrual flux, such as hypomenorrhea or menorrhagia.

When there is hypomenorrhea, the association of pains and clots is difficult to explain and presents a different therapeutic problem.

When there is menorrhagia, the pain seems to be due to uterine distention with transitory and repeated hematometria. The uterine cavity is only nominally a cavity, but under certain circumstances, such as hyperthrophy, submucous fibroma, sclerosis or retroversion, it may become a real cavity in which blood accumulates and clots. This variety of dysmenorrhea is more organic than functional.

3. *Congestion:* Uterine congestion is much more intense in ovulatory than in anovulatory cycles. Congestive functional dysmenorrhea has been known for centuries, and congestion, without a doubt, is an important etiologic factor. Clinically the patient complains of painful premenstrual tension and of dysmenorrhea, most frequently of the obstructive type. From the time of ovulation, such a patient feels abdominal tension and pain which increases progressively until menstruation has begun.

Congestion is produced by many factors: (1) local factors, such as retroversion, chronic infection, cervicitis, increase of intra-abdominal pressure or constipation; (2) hormonal factors, e.g., hyperestrinism; (3) sexual factors, and (4) psychic factors.

Together or separately, these factors create an increase in the physiologic congestion that accompanies menstruation. For example, cervicitis may cause secondary obstructive dysmenorrhea in multiparae; a simple electrocoagulation will cure the cervicitis and the accompanying dysmenorrhea. In other cases congestion may be relieved by the correction of retroversion; by a reducing diet, which will diminish the intra-abdominal pressure; by adequate treatment of constipation; by physical exercises, or by normal sexual behavior.

4. *Spasms of the isthmus:* Spasmodic dysmenorrhea is a very old entity, and many authors have endeavored to prove its existence; Claude Beclère, for instance, by hysterographic methods, and Bickers by manometric tracings on an intrauterine bag. It has been demonstrated that, during the luteal phase, the tonus decreases while the amplitude of the uterine contrac-

tion is increased. Bickers tried to show that in the presence of spasmodic dysmenorrhea there is an increase of the tonus, frequency and amplitude of the uterine contractions. This pseudotetany of the uterus is resistant to treatment by estradiol, progesterone, atropine and ephedrine but reacts to morphine and pavatrine. Because of the increased uterine tonus, progesterone has been used as a therapeutic agent in cases of spasmodic dysmenorrhea, but generally without success. Estradiol, on the other hand, seems more successful. If it is given from the tenth to the twenty-fifth day of the cycle, it helps to soften the cervix and menstruation is usually much less painful, if painful at all.

During the past few years other theories have been advanced, among them that of the "meno-toxin." It is quite possible that these toxic substances produce a spastic reaction. When one realizes that the cervix is rich in neuroganglionic elements, this theory becomes quite plausible. Keiffer has demonstrated, under the cervical mucosa, numerous sensory nervous corpuscles, and has described a "trigger pain area" at the periphery of the sphincter. Thus, the correlation between pain with menotoxin, a hypertonic cervix and ovulatory menstruation, is strengthened by the fact that anovulatory cycles are painless, with a very small output of menotoxins.

A theory somewhat analogous to that of the menotoxin is that of the "metra-allergies." This term is used by those who consider dysmenorrhea an allergic phenomenon, with local edema of the genital tract and other manifestations. The basis of this theory is the fact that, when epinephrine or an antihistamine such as benadryl is administered during an acute crisis, the pain is often alleviated, and also, on a clinical observation that sudden anger or emotion will cause the pain to disappear.

Nonobstructive Functional Dysmenorrhea.—Let us now consider nonobstructive functional dysmenorrhea, with which no impediment to the menstrual flow seems to exist. The pain may be initial, of short duration, or it may last all through the menstrual period. When the pain is initial and when there is no impediment to the flow, the pain may be considered due to a vasomotor crisis (angiospasm). Physiologic knowledge of menstruation indicates that necrosis of the uterine mucosa is preceded by vasoconstriction of the terminal spiral arteries. This vasoconstriction is not necessarily limited to the functional layer of the uterine mucosa, for it may extend to the whole utero-adnexial-arterial system. Is this phenomenon due to Smith's menotoxins, or to pitressin liberated because of a decrease in estrogens? Nobody knows, but the therapeutic results certainly show that vasodilatators, such as priscoline, have a salutary effect. It may also be argued that section of the presacral nerve is effective, partly because of the vasodilatation consequent upon sympathectomy. This vasomotor theory is in vogue at present, but it must not be unconditionally accepted.

On the other hand, when there is a constant, steady pain throughout menstruation, one may consider it due to "relative ischemia" of the myometrium. Such conditions as uterine hypoplasia, hypotension and hypothyroidism may cause a decrease in myometrial circulation and in metabolic values.

In the presence of hypoplasia there is insufficient vascularization, and Novak has expressed the opinion that relative impermeability of the blood vessels exists.

Occasionally, hypotension may be the cause of dysmenorrhea. Moire stated that the uterine contractions are capable of preventing arterial pulsations; it follows that if hypotension exists the pulsation will be impeded with greater facility. All gynecologists, however, know women with

hypotension and without dysmenorrhea.

Hypothyroidism is a much more frequent cause of nonobstructive functional dysmenorrhea, and the excellent results of thyroid extract are well known.

Finally, the "anoxia" of the myometrium may be due equally to the poor quality of the circulating blood, as with chloroanemia. The good results of iron therapy here are too well known to need discussion.

This concludes a brief analysis of functional dysmenorrhea, for successful treatment of which an improved clinical understanding is needed. A considerable amount remains to be added on the psychic factors involved, which are highly relevant but lie beyond the scope of this article.

SUMMARY

The author discusses functional dysmenorrhea, obstructive and nonobstructive, which he classifies as (1) true functional dysmenorrhea with disturbances of the phenomena of menstruation; (2) functional dysmenorrhea of psychogenic origin, and (3) pseudodysmenorrhea, with exaggeration of extragenital pain during the menstrual period.

The obstructive condition is associated with clotting, uterine debris, a distended uterus, congestion (local, hormonal, sexual or psychic), spasms of the isthmus, and toxic or allergic menstrual disturbances. With the nonobstructive type there are initial pain, vasomotor crises (angiospasm), ischemia, hypoplasia, hypotension, hypothyroidism and myometrial anoxia.

RÉSUMÉ

L'auteur discute la dysménorrhée fonctionnelle obstructive et non-obstructive, qu'il divise comme suit: 1) dysménorrhée fonctionnelle vraie avec troubles des menstruations, 2) dysménorrhée fonctionnelle d'origine psychogénique, 3) pseudo-dysménorrhée avec exacerbation des douleurs menstruelles.

La dysménorrhée obstructive s'accompagne de coagulation sanguine, de débris utérins, d'un utérus distendu, de congestion (locale, hormonale, sexuelle ou psychique), de spasmes des isthmes, et de troubles menstruels toxiques ou allergiques. La dysménorrhée du type non-obstructif est caractérisée par les symptômes suivants: douleurs, crises vasomotrices (angiospasmes), ischémie, hypoplasie, hypotension, hyperthyroïdisme, anoxie de la musculature utérine.

RIASSUNTO

L'autore tratta delle dismenorree funzionali, ostruttive e non ostruttive, e le classifica in (1) dismenorree funzionali vere con disturbi dei fenomeni del, mestruo; (2) dismenorree funzionali di origine psichica e (3) pseudodismenorree, con esagerazione del dolore extragenitale durante il periodo mestruale.

Le condizioni ostruenti sono rappresentate dalla coagulazione, dai detriti uterini, dalla distensione dell'utero, dalla congestione (locale, ormonale, sessuale o psichica), dagli spasmi dell'istmo, dai disturbi mestruali tossici o allergici.

Il tipo non ostruttivo comprende il dolore iniziale, le crisi vasomotorie (angiospasmo), l'ischemia, l'ipoplasia, l'ipotensione, l'ipotiroidismo, l'anossia miometrale.

SUMARIO

O autor discute a dismenorreia funcional, obstrutiva e não-obstrutiva, que classifica como (1) dismenorreia funcional verdadeira com distúrbios dos fenômenos da menstruação; (2) dismenorreia funcional de origem psiquicogênica, e (3) pseudodismenorreia, com exagero da dor extragenital durante o período menstrual.

A condição obstrutiva está associada

com coagulação, fragmentos uterinos, útero distendido, congestão (local, hormonal, sexual ou psíquica), espasmos do istmo, e distúrbios ménstruais tóxicos ou alérgicos. Com o tipo não obstrutivo há dor inicial, crises vasomotores (angioespasmo), isquemia, hipoplasia, hipotensão, hipotiriodismo e anóxia miometrial.

ZUSAMMENFASSUNG

Der Verfasser erörtert die funktionelle Dysmenorrhöe mit oder ohne Bestehen von Obstruktion und gibt folgende Gruppeneinteilung:

1. Die echte funktionelle Dysmenorrhöe mit Störungen der Menstruationserscheinungen.

2. Die funktionelle Dysmenorrhöe seelischen Ursprungs.

3. Die Pseudodysmenorrhöe, wo Schmerzen extragenitalen Ursprungs während der Menstruation in übertriebenem Masse auftreten.

Die obstruktive Form der Dysmenorrhöe geht mit Klümpchenbildung einher, mit Zelltrümmern in der Gebärmutter, Erweiterung des Uterus, Stauung (lokalen, hormonalen, sexuellen oder seelischen Ursprungs), mit Krämpfen des unteren Gebärmuttersegments und mit toxischen oder allergischen Menstruationsstörungen. Bei der nicht obstruktiven Form werden Schmerzen bei Beginn der Periode, vasomotorische Krisen (Gefässkrämpfe), lokale Blutarmut, Hypoplasie, Hypotonie, Hypothyreoidismus und mangelhafte Sauerstoffversorgung der Gebärmuttermuskulatur beobachtet.

Victory over things is the office of man. Of course, until it is accomplished, it is the war and onslaught of things over him. His continual tendency, his great danger, is to overlook the fact that the world is only his teacher, and the nature of sun and moon, plant and animal only means of arousing his interior activity. Enamored of their beauty, comforted by their convenience, he seeks them as ends, and fast loses sight of the fact that they have worse than no values, that they become noxious, when he becomes their slave.

—Emerson

. . . When a man stupid becomes a man inspired, when one and the same man passes out of the torpid into the perceiving state, leaves the din of trifles, the stupor of the senses, to enter into the quasi-omniscience of high thought—up and down, around, all limits disappear. No horizon shuts down. He sees things in their causes, all facts in their connection.

—Emerson

Orthopedic Surgery

Immediate Treatment of the Injured Hand

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THE injured hand poses many problems that are not encountered in other parts of the body. Anatomic knowledge plus familiarity with the physiopathologic processes of the body, especially of the superspecialized structures of the hand (tendons, nerves, skin, small bones, and joints of these easily traumatized nondistensible tissues) help in the surgical treatment of the hand.

Since the practice of medicine or surgery is an art based on science, and since the treatment of trauma is predicated upon the several individual injuries incurred, few axioms may be set down as guides. The following suggestions seem to be the most useful.

Preanesthetic Examination.—This procedure, if carried out without haste on the still sentient and responsive patient, immediately permits the surgeon to outline his surgical procedure, shows him injuries that would have taken protracted operating time to find on the anesthetized patient, and saves the hand from unnecessary probing and exploring. Such an examination includes: observation without the dressing, palpation of the structures beneath unbroken skin only, careful neurologic testing, and, above all, a demonstration by the patient of his abilities and inabilities in the active use of all structures.

The wound need not and must not be probed, retracted or otherwise manipulated until it and the surgeon have been surgically prepared and draped!

Anesthesia.—It has always seemed senseless and cruel to me to scrub an open cut anywhere on the body with soap, water, alcohol, ether, tincture of green soap, iodine or the detergents, and *then* inject procaine hydrochloride through the raw edges of the skin with many jabs of the needle in order to suture. Not only is the procedure inhuman, but it is against surgical principle to push a needle deliberately through a potentially contaminated area of fat and muscle into healthy tissue.

If the wound is sufficiently small to warrant a definitive surgical procedure with the region under local anesthesia, I always establish a regional block through one needle injection neurologically proximal to the wound before I touch the wound itself. This procedure is based on two principles:

1. One can approach surgical sterility more closely on unbroken skin than on abraded skin or raw subcutaneous tissues (if one refrains from causing damage to the raw tissues). It is therefore safer to insert a needle through the unbroken skin.

2. It is a human approach. If any slightest indication for general anesthesia exists, however, such as protracted operating time, suture of deep structures or open reduction of a fracture, I always use general anesthesia.

A Bloodless Field.—Whether or not to use a tourniquet is often a grave question. Actually it is quite simply solved: If gen-

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eral anesthesia is used, the tourniquet is always employed, high on the upper arm. If local anesthesia is used, the tourniquet cannot be applied.

The traditional rubber band at the base of the finger constitutes a serious threat to the circulation and should never be used. Also, bleeding constitutes such a serious threat to good surgery that the tourniquet plus general or brachial block anesthesia must always be employed on injuries that involve the repair of much more than the skin.

Surgical Cleansing.—Drs. Koch and Mason have long since established the efficacy and gentleness of prolonged cleansing of the anesthetized tissues with mild white soap and water applied with sterile scrub gloves on sterile wads of cotton. Such a technic relies upon the saponification of greasy débris, the mechanical cleansing effect of the soapy cotton, the dilution factor of bacteriology, and above all the principle that healthy nontraumatized raw tissues have a tremendous resistance to the isolated bacterium that may be left in its depths after any type of cleansing.

Physiologically Moist Tissues. — When one considers the state of raw muscle, nerve, tendon, and fat exposed either to the air or to dry sponges used throughout an operation of any length, one pictures the wet, vibrantly alive fish that is caught in the morning and is left on the rocks or on the deck in the sun all day. Very shortly it curls, changes color and stiffens. Should it miraculously come to life again in the evening, this layer of desiccation-killed tissue would be sloughed off or replaced by an encasing fibrous cicatrix.

Tissues protected only by their cell membranes will show the early changes of desiccation. The fibrosis one wishes to prevent thereby becomes inevitable. It is, therefore, imperative that tissues be kept constantly moistened throughout the operative procedure.

Grafting Tissues.—Tissues cut free of their normal bed are potentially dead. They can survive only under the best environment of circulation and asepsis. The only exception is the thin split thickness skin graft, which will "take" even in the presence of moderate infection.

This means, then, that free grafts of tendon, nerve or bone cannot be made at the time of trauma. Such procedures must be delayed until sound healing has taken place. Full thickness skin grafts, however, may be used at the time of initial surgical treatment, provided that the bed is well vascularized, that the wound is "clean" and seen early, and that a proper surgical preparation has been done.

Fractures.—The reduction of fractures takes first place in the sequence of repairs of trauma of the hand. Whether tendons or nerves are repaired or not at time of initial operation, the fracture fragments should be fixed then, because (1) rapid healing makes subsequent repair difficult and (2) the fact that very minor displacements in angulation or rotation of these tiny bones reduces the efficiency of manual function makes it mandatory to reduce them at the optimal time, which is immediately.

Injured Tendons.—Sutures can no more hold tendons together against tension than they can hold unsplinted fractured bones.

Tendons are too often treated as inanimate rope. Sutures are therefore heavy, and much material is sewn back and forth throughout an inch or so of each severed end of the tendon in an effort to splice it strongly.

This is a completely erroneous approach to the treatment of tendons. First, when massive amounts of suture are used, the foreign body acts as an irritant and fibrosis ensues. Second, the tight masses of suture strangulate an already precarious blood supply. Loss or reduction of that circulation leads to necrosis, which is followed by the fibrosis that one wishes to

prevent. Third, sutures placed under tension in tendons soon slough through, as they do when placed under tension in any other living tissue.

In the suture of tendons, "position is everything." The surgeon places the ends in approximation only after he positions the wrist and fingers—all in acute flexion when the flexor tendon has been cut, or in moderate extension when an extensor tendon has been cut. The position will hold the ends of the tendon together. Fine, delicate sutures are used sparsely only to maintain the needed intimate contact of the fibers that might otherwise grow wildly past the anastomosis or tightly to the surrounding tissues.

Injured Nerves.—"Always tie a piece of black silk through each end of the cut nerves so that they can be found later, and close up the skin." This time-honored cliché is a paradox.

If the patient with a severed nerve presents himself before the wound is eight hours old, the wound should be cleansed and the nerve sutured. If the wound is extraordinarily contaminated and/or more than eight hours old, the usual surgical preparation is carried out but only the skin is closed.

The problem is not whether the nerve will or will not heal. It is a problem of bacteriology. Properly approximated peripheral nerves will heal together and reinnervate the distal tissues in the absence of infection. Sutured nerves in the presence of infection will become most purulent at the site of anastomosis, because of the presence of foreign bodies, i.e., sutures.

Therefore, if clinical judgment indicates suturing, I suture. If there is imminent danger of the development of infection I do not suture, nor do I place "identifying sutures" (which are no different from anastomosing sutures) in the nerve ends.

Compression Dressing. — I have seen many operative sites closed with one of the surgical team leaning with all his weight upon the wound to keep the blood in! This is not the reason for the compression dressing that is used after an operation upon the hand. Rather, this desperate situation is prevented by careful homostasis.

Postoperative compression dressings are used to promote the circulatory exchange in this way:

All manipulation of living cells is attended by trauma, whether it is caused by unplanned phenomena, such as accidents, or by surgical intervention. Such trauma is attended by subsequent transudation of tissue fluids from the unbroken but exposed cells and by exudation of fluids from those cells, with disrupted membranes. Such trauma is also attended by the accumulation of fluids in the intercellular spaces and in the cells themselves. Collections of fluid within the wound prevent coaptation and healing. The deposition of edema reduces circulation severely and, if uncontrolled, will so increase as to make the tissues hard, reduce lymph, venous and arterial circulation to zero and result in gangrene.

A firm but resilient fluffed gauze dressing held on by an overall woven elastic bandage prevents the formation of edema and the collection of serum, but need not be applied so tightly as to embarrass the circulation.

Postoperative Splinting.—I should never expect a fractured bone to heal without immobilization. There would be constant disruption of proliferating capillaries and bone, as well as a constant state of edema and reduced circulation due to constant irritation of the site of injury. Nor can I, for similar reasons, expect rapid sound healing of normal tissues to occur in injured hands without immobilization. All injuries of the hand, with the exception of minor skin lacerations, are permitted better healing if the hand is splinted.

Mason aluminum splints for mainte-

nance of the functional position are usually ideal for massive injuries. Fractures, too, are splinted along with the remainder of the bones in the ray in a "position of rest" in which all muscle-tendon tensions are reduced to a minimum. Lacerations of skin, tendon and nerve demand that the hand be splinted so that the least possible tension is present. Rest is then essential, as it is to the healing of all tissues.

Elevation.—Trauma to tissues, whether inadvertent (caused by external violence) or definitive (caused by surgical maneuvers) always leaves incipient edema in its wake. Edema then increases the tissue pressure, which in turn compresses the lymph channels. The edema increases as a sequence of lymph stasis, and the tissue pressure closes the venous return.

A reduced venous return then results in venous stasis or a further loss of fluid into the cells and interstitial spaces, until ultimately the skin of the extremity is hard, stretched and shiny. Arterial shutoff is then rapidly followed by frank gangrene.

Arrest of further formation of edema at any stage short of complete vascular shutoff, even though it does not lead to gangrene, slows the processes of healing, increases the chance of bacterial invasion because of lowered tissue resistance and is followed by fibrosis in all the edematous tissues.

It is imperative that the repair of major traumas in the hand be followed by elevation of the extremity for the duration of the edematous diathesis, which is two to four days unless the injury is severe.

The patient with a major trauma is kept flat in bed for this period, with his arm and hand nearly in a straight line from his shoulder, at an elevation of 45 degrees from his torso. The patient with an injury that does not keep him in the hospital is ordered to keep his hand at the level of his ear for this period.

SUMMARY

The treatment of injuries to the tissues of the hand can be followed by a high degree of successful healing and function. Such wounds, if treated in the traditional way of "minor surgery," lead to major disasters. Similar wounds to these delicate specialized structures, when treated as major surgical problems, however, leave but minor incapacities.

RÉSUMÉ

Dans les cas de lésions des tissus de la main l'auteur a obtenu un pourcentage élevé de guérisons et de récupération fonctionnelle. Il attribue ces succès au fait qu'il recourt de préférence à des moyens opératoires majeurs. Il souligne l'importance des facteurs suivants: examen préanesthésique, préparation méticuleuse, anesthésie prudente, champ opératoire exsangue, nécessité de maintenir les tissus physiologiquement humectés, valeur et application judicieuse des greffes. Le traitement des fractures de la main, des lésions des tendons et des nerfs, et l'utilisation des attelles et de pansements spéciaux sont décrits. L'auteur estime que chaque stade traitement nécessite une attention aussi minutieuse que lors d'une opération majeure.

RIASSUNTO

Nella pratica dell'autore la cura delle lesioni delle parti molli del capo fu in genere seguita da guarigioni soddisfacenti dal punto di vista anatomico e funzionale. Egli ritiene che tale successo sia dovuto al fatto che egli tratta tali lesioni con interventi accurati: esame minuzioso della ferita o della frattura, preparazione meticolosa, anestesia adatta, chirurgia incruenta, mantenimento dei tessuti in un grado di umidità fisiologico; viene data molta

importanza ai trapianti e al loro uso appropriato.

Viene trattata anche la metodica del trattamento delle fratture della mano, delle ferite dei tendini e dei nervi, l'uso delle stecche e delle fasciature compressive. In ogni momento si deve essere attenti e accurati come durante ogni intervento di grande chirurgia.

SUMARIO

Na prática do autor o tratamento de lesões aos tecidos da mão é em seguido de alto grau de cicatrização e função bem sucedidas. O autor isso atribui ao fato de que trata tais lesões mais em uma base operatório.

O exame preanestésico da ferida ou fratura, a preparação meticulosa, a técnica anestésica cuidadosa e adequada, a operação em um campo exangue e a necessidade de se conservar os tecidos fisiolôgicamente úmidos são salientados, e a significação dos enxertos e seu uso apropriado ressaltada. O tratamento das fraturas manuais, as lesões aos tendões e nervos, e o uso de talas e ataduras de compressão, são revistos. Em tôdas as partes do tratamento, o autor está convencido de que a compreensão e atenção aos detalhes são tão imperativos como a realização de qualquer grande operação.

ZUSAMMENFASSUNG

Der Verfasser sieht, dass in seiner Praxis Behandlung von Handverletzungen im allgemeinen zu höchst erfolgreicher Heilung und zu Wiederherstellung der Funktion führt. Er schreibt diese Beobachtung der Tatsache zu, dass er die Behandlung solcher Verletzungen auf einer verhältnismässig breiten operativen Basis aufbaut. Er legt Wert auf Untersuchung der Wunde oder des Bruches vor der Anästhesierung, auf peinlich genaue Vorbereitung, auf sorgfältige und dem Falle angemessene Technik der Anästhesie, auf Ausführung der Operation in blutleerem Gebiet und auf physiologische Feuchthaltung der Gewebe. Er weist auf die Bedeutung von Transplantaten und ihrer richtigen Anwendung hin und gibt einen Überblick über die Behandlung von Handbrüchen, Sehnen-und Nervenverletzungen und über die Anwendung von Schienen und Kompressionsverbänden. Der Verfasser ist überzeugt, dass in jeder Phase der Behandlung Umsicht und Beachtung aller Einzelheiten genau so unerlässlich sind wie bei allen grösseren Operationen.

Let us never forget that every station in life is necessary; that each deserves our respect; that not the station itself, but the worthy fulfillment of its duties does honor to man.

—*Lyon*

Advances in Plaster Technics

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THE use of some type of immobilizing material dates to the earliest days of mankind. As far back as 1600 B. C. the Egyptians had advanced beyond the use of permanent wooden splints and had used bandages impregnated with gums and waxes in order to provide protection. Actually, calcine gypsum or plaster of paris was known to the early Egyptians, who were accustomed to coating the interiors of tombs as early as 4000 B. C.

Hippocrates used bandages impregnated with wax and resin; a similar material, made of lime and egg white to stiffen bandages, was employed by Europeans up to the sixteenth and seventeenth centuries. Rhazes of Arabia describes the use of egg white in the ninth century, and other reports indicate that its use continued as late as 1834, with modifications such as those devised by the French, who added ground-up blotting paper to increase its hardness.[1]

In 1828 liquid plaster was used, the limb being encased in a wooden box and plaster poured about it, with later removal of the box; a somewhat similar system is reported as used even earlier in Bokhara (1798). Heavy starch splints were used by Baron Suetin in 1834, who removed the splints to observe and dress the wound. The first to report the use of bandages impregnated with plaster of paris was Matthysan, a Dutch army medical officer, in 1852, and these continued to be employed throughout the Crimean War. By 1900 plaster of paris was generally accepted and had largely replaced the earlier types of splint, such as starch bandages, paraffin bandages, etc.

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In the early 1930's Lorenz Bohler,[2] the eminent Austrian orthopedic surgeon, and the British Medical Association Fracture Committee in its 1935 Report,[3] demonstrated and described the efficacy and economy of functional use of fractured limbs as a means of getting injured workers back to work quickly with a minimum of physiotherapy and rehabilitation and the lowest possible drain on insurance companies for compensation. This was possible only with quick setting, light, yet exceptionally strong plaster of paris in the modern plaster of paris bandage.

Plaster of paris is powdered, dehydrated gypsum, derived from rock imbedded in the ground, like limestone and other rocks. The various deposits of gypsum vary in purity and in content. The more impure types are used for building purposes, and the pure white gypsum is reserved for medical and dental purposes. Gypsum varies in quality according to geographic deposits, some varieties lending themselves more favorably than others to use in plaster of paris bandages. That used in the Gypsona® bandage, obtained from a special quarry in England, is peculiarly well suited to its purpose. Gypsum, in its natural state, is a hydrous crystalline calcium sulfate containing four-fifths calcium and one-fifth water. The gypsum is prepared for medical use by dehydration and addition of an accelerating or retarding agent, depending upon the type of plaster to be manufactured and the purpose for which it is intended. Setting time may be accelerated to three to five minutes or retarded as much as twenty to thirty hours (as used in the building trades). The acceleration is usually secured by the addition of so-

dium chloride or gypsum crystals when the plaster is for medical use; when it is used commercially, such substances as animal hair, horny organic material, gelatin or vinegar are added to slow down the hardening process by exerting a protective colloid action.[4] The setting action of plaster after wetting is actually a process of crystallization that continues until complete, as evidenced by the complete drying out of all water.

During the first World War, plaster of paris was not generally used in the combat zones in the treatment of fractures or compound wounds. It was not until the Spanish Civil War, in 1936-1937, that Trueta popularized its extensive use for the treatment of compound war injuries.[5] After his excellent results and experiences became known, plaster of paris had exceedingly wide use in World War II and was the principal agent of immobilization in transportation of the wounded. It greatly aided quick evacuation of the wounded from the fighting zone to the interior for more definitive care, making combat medical units more mobile, increasing the patient flow, and thereby increasing the volume of medical service.

Among the first of the newer plastic materials offered as a substitute for plaster of paris was "Castex Rigid Bandage," composed of alkyl cellulose pyroxylin, C.P. boric acid, C.P. acetone (voltaile solvent), and surgical gauze, each bandage supplied in individual cans. The advantages of water resistance and lightness were more than offset, however, by frequently encountered sensitivity to the lacquer on the patient's skin and the surgeon's hands; the delayed setting time (thirty to sixty minutes); the irritating odor; the inflammability of acetone in a closed room; increased storage space required for the individual cans, and the high cost. The inconvenience of an additional application of lacquer the following day also presented a serious drawback.

Later, in the search for a substitute for plaster, a form of glass plastic bandage, dipped in a special solution of acetone base, was introduced under the name "Aire-Cast," later changed to "Aire-Lite." It was advocated for its extremely light and porous construction, transparency to roentgen rays and imperviousness to practically all liquids commonly encountered, so that the patient could bathe and use the cast even while swimming or ocean bathing. The "Aire-Lite" bandage is made from fine strands of fiberglas and cellulose acetate which, when set, comprise a smooth inner glass and cellulose acetate cylinder. This bandage has been used extensively, but much of its initial popularity has been lost because of several disadvantages, such as the need for very fast application to prevent layering, and the very slow drying time (forty-five minutes to an hour even with the use of an expensive heater-blower apparatus). This results in loss of time to both the patient and the doctor, with retardation of use of the plaster room. Frequently the bandage sticks together after immersion and cannot be applied smoothly in layers, because of the adherence of one layer to another. Also, the stockinette and felt padding, although treated to be water-repellent, is usually not water-repellent; when the cast is immersed in water the patient often complains that the lining is soggy and wet for many hours afterward, which makes this feature rather impractical even though the cast itself remains intact. Occasional cases are encountered of cutaneous irritation from the setting fluid, with severe pruritus beneath the cast, sometimes requiring its premature removal. In addition to the high cost, the odor of ether and acetone makes its use rather impractical in small closed rooms and prevents use of the room for some time thereafter. However an "Aire-Lite" cast has certain advantages, owing to its extreme lightness and imperviousness—e.g., it permits roentgen

examination without removal of the cast.

Both "Aire-Lite" and "Castex Rigid Bandage" casts have the disadvantages of being difficult to wedge for correction of position, since it is difficult to apply the additional bandage and secure good adherence. In addition, both are apt to wrinkle during the long setting process unless meticulous care is exercised by the assistant who holds the extremity. Wrinkling must be avoided to prevent pressure areas and resultant local ulceration of the skin.

Recently, melamine resin bandages have been introduced. Melamine was tried first as a chemical added to water for immersion of the regular plaster bandage; later it was modified as bandages impregnated with resin to be immersed in plain water. These bandages eliminate the need of a special pail for the sticky residue, which is difficult to cleanse from the container. Melamine resin bandages are now in popular use and have certain advantages over regular plaster. They are water-resistant (although not completely waterproof), light, firm and durable. Little plaster is lost in the wetting process, which means that almost the entire plaster content of the bandage is utilized and incidentally that the risk of the blocking of drains by the discarded water is reduced. Reactions to the resin are occasionally encountered, however, both by the patient and by the surgeon, and the finish is a dull, dirty gray, which does not give the shiny, smooth appearance obtained with a well-finished regular plaster cast. Melamine resin ("Melmac") casts are difficult to cut and will dull plaster knives, shears or electric cast cutters. There are, however, definite indications for their use, and they have their advantages, especially for children. Frequent wetting from urine may soil a hip spica cast, for example, and require frequent changes of the cast, with the attendant risk of loss of position in a difficult correction.

In addition to the various plaster substitutes, there are several types of plaster of paris available. These include molding plaster, with a setting time of thirty minutes, which makes a dense, firm cast; alabaster plaster, similar to molding plaster but whiter, and more expensive because of the more careful selection of rock material, and dental plaster, with a setting time of thirty minutes, generally used in plaster of paris bandages for medical use, with a setting time ranging from two to fifteen minutes, depending on the addition of accelerating agents.

There are many factors and variable situations that may make the choice of a particular grade or brand of plaster important to the successful achievement of the purpose desired. In the military, a material that produces a strong, light cast will conserve supplies, transportation facilities and personnel time, thereby increasing effectiveness and combat use. A light strong cast is important for such patients as an elderly woman with a Colles fracture; daily activities and exercises for the elbow and shoulder are facilitated, which prevents adhesions and improves local circulation and muscle power, with the cast still holding the desired position. In walking heel casts, knee-cylinder casts and other such casts on the lower extremities with which the patient is ambulatory, lightness has obvious advantages; it increases the mobility of the patient, involves less swelling and fatigue and imposes less burden on the vital circulation of the extremity involved.

Several excellent brands of plaster of paris are now available on the general market, each varying in preparation, setting time and packaging. After extensive use of many such products, it is our opinion that the Gypsona® bandage offers advantages in most situations requiring plaster immobilization. The special non-fraying woven cloth is thoroughly and finely impregnated with highly refined and

dehydrated gypsum; a maximum of plaster is used in each bandage, and the bandages are limited to 3-yard lengths for easy wetting and quick application. Complete wetting is achieved in three to five seconds, with little loss of plaster in the immersion basin, more complete utilization of each bandage roll, reduction of the mess and less danger of damage to the sink drain. The cast sets in five minutes or less, depending on the water temperature and the mineral or crystal additives, and becomes a strong, light plaster with a brilliant creamy white finish, in contrast to the crumbly, off-white, less durable cast obtained with other types of so-called "fast-setting" plaster. The layers of special cloth are easily and quickly integrated one into the other by slight rubbing, which makes a firmer bandage and thereby uses less plaster. Actually, the end of the bandage is more difficult to find than with other types, because of its complete integration into the plaster. The end, therefore, should be carefully indicated with a marking pencil when removal of the cast at home by the patient is desired. Plastic inserts in the center of each bandage help to prevent telescoping of the bandage and aid in its smooth application. With a second immersion period of three to five seconds, there is no loss of time in application. The quick setting time facilitates retention of a difficult position with less danger of slipping. The finished product is smooth and whiter than regular plaster. It provides an ideal finish for marking and dating the cast, or even as a surface on which well-wishers may inscribe their greetings. An added quality of this plaster is that it permits bivalving and periodic removal; the edges which do not crumble, and the usual loose plaster particles are not present. In bivalving a freshly applied Gypsona® cast, however, caution must be exercised, as a sharp knife penetrates this plaster quite easily. Use of a protective felt strip 1 inch (2.5 cm.) wide under the line of splitting is a wise precaution unless the cast is heavily padded. Patients often state that this cast stays clean longer than others do, but this is probably due only to the much whiter original appearance.

In application of the Gypsona® bandage less plaster is used than ordinarily, because of its very firm consistency when set. The 3-yard roll bandages are a definite advantage in the application of extremity casts, discouraging a common tendency to use an excessive amount of plaster. This length, however, may be a disadvantage in the application of large casts, such as body jackets and hip spica casts, when a larger number of bandages must be used, and preferably 4-yard Gypsona® bandages should be employed. In such cases, reinforcement of the cast by ridging may be helpful. The center of a two-layer or three-layer splint should be gathered into a fine ridge and placed over a joint or other point of stress.

Plaster of paris has been unquestionably more helpful in correction of deformities, especially in children, than have the plaster substitutes. It is more malleable and quicker setting, and it lends itself to follow-up corrective wedging procedures more easily than do other materials. A quick-setting plaster that makes a firm cast is especially useful in the correction of pedal deformities in children, who find it difficult to retain a desired position for more than a few minutes. In addition, the light, brilliant white cast is more favorably accepted by the anxious parents concerned with the circulation and with the amount of added weight the small child must carry.

SUMMARY

In the constant search for a replacement or addition to the traditional plaster of paris for immobilization of the body and extremities, several new materials have

been developed by plastic chemists in the past two decades. Although each agent advanced offers distinctive properties and advantages, repeated use has demonstrated positive handicaps restricting it to special situations and rendering it undesirable for general use as a full replacement for plaster of paris.

When bathing of a part is especially desirable, as in hydrotherapy for a neuropsychiatric disorder in a patient with an intervening fracture, or when recreational bathing is urgently desired (fracture in an emotionally disturbed child at a summer camp) "Aire-Cast" is probably the agent of choice, since it is least likely to deteriorate from the constant wetting. All padding should be thoroughly treated to achieve some water repellence, and the patient should be advised to dry the cast well after each immersion. Such a cast can be applied only to nondisplaced fractures or when partial union has already been obtained with preliminary plaster immobilization. Casts impregnated with melamine resin are of some value for such purposes, but are less likely to remain intact than is the glass plastic material.

Plaster impregnated with melamine resin lends itself well to the treatment of small children or incontinent adults, in whom repeated soaking of a hip spica or a body cast by urine is apt to cause deterioration, cracking and constant unpleasant odors. "Melmac," which appears to be the most satisfactory product of this type now available, will add to the serviceable and efficient use of casts encircling the perineum. Because of its slightly delayed setting period it may be advisable to apply faster setting regular plaster or "Gypsona®" first, then apply "Melmac" or a similar product as an outer protective coat.

In view of their somewhat greater sensitivity, delayed setting time, increased cost, and increased time required of personnel for application and drying, the plaster substitutes should not be routinely employed but reserved for special situations. For general use, a rapidly setting, strong, light plaster of paris cast, as exemplified by the "Gypsona®" bandage, will serve as the best immobilizing agent in the hands of most surgeons. Despite the many recent advances made in the realm of plastics, time-honored plaster of paris, perhaps with added modern refinements, remains the most generally valuable material for immobilization of the body and extremities. It does not appear probable that it will be completely replaced.

RÉSUMÉ

Plusieurs dérivés de matières plastiques ont été proposés par l'industrie chimique au cours des deux dernières décades en vue de remplacer ou de compléter le traditionnel plâtre de Paris. Malgré certains avantages ils ne peuvent pourtant être utilisés que dans des cas particuliers, et leur emploi ne saurait être généralisé. Lorsque des bains partiels ou généraux sont indiqués (par exemple: hydrothérapie en neuropsychiatrie lors de fractures, etc.), le plâtre "air-caste" peut être recommandé comme étant celui qui offre la meilleure résistance à l'eau. Tous les bandages devraient alors être traités de façon à assurer un maximum d'imperméabilité (bien sécher le plâtre après immersion). Un tel plâtre ne peut être appliqué que dans les fractures sans déplacement ou après avoir obtenu une réduction partielle (immobilisation par un plâtre ordinaire préalable). Les plâtres imprégnés de résine ont une certaine valeur dans ces cas, mais ils sont moins résistants que le matériel plastique.

Le plâtre imprégné de résine peut être utilisé avec avantage chez les jeunes enfants et les adultes incontinents. Le produit de ce genre le plus satisfaisant semble être le "Melmac," en particulier pour les plâtres entourant le péritoine. En raison de son temps de durcissement légèrement

augmenté il peut être indiqué d'appliquer d'abord un plâtre ordinaire que l'on recouvrira d'une couche protectrice de "Melmac" ou d'un produit similaire.

En conclusion les substituts du plâtre devraient être réservés à des cas spéciaux. Ils sont plus délicats à manier et à poser, ils sèchent plus lentement. Nécessitant plus de temps de la part du personnel hospitalier ils sont aussi plus onéreux.

RIASSUNTO

Nell'incessante ricerca di materiali da sostituire o da aggiungere al gesso per la confezione di apparecchi di immobilizzazione del tronco e delle estremità, molte nuove sostanze sono state approntate dia chimici negli ultimi due decenni. Benchè, però, ciascuna di esse presenti reali vantaggi, il loro impiego continuato ha dimostrato che esse hanno anche degli inconvenienti che ne limitano l'uso a casi speciali e che le rende inutilizzabili nella maggioranza degli altri casi.

Quando si richieda, ad esempio, un bagno, come può avvenire in un paziente neuropsichiatrico che abbia anche una frattura, o quando si tratti di un ragazzo emotivo, allora è preferibile l'uso dell'Aire-Cast, che non si altera al contatto dell'acqua; l'imbottitura deve essere trattata con cura onde acquisti il potere di non assorbire acqua e il paziente deve asciugare per bene il gesso dopo ogni immersione. Tale apparecchio, però, deve essere applicato soltanto alle fratture senza spostamento o quando sia stata già ottenuta una parziale consolidazione. Per tali scopi sono anche utili i gessi imbevuti di resina melamina, ma sono meno resistenti di quelli di materia plastica. Essi si comportano bene se impiegati nei bambini piccoli o negli adulti con incontinenza urinaria, in cui l'impregnazione da parte della urina causa un logoramento dell'apparecchio o la sua rottura o un continuo odore sgradevole. Il prodotto migliore in questo campo, fra quelli che si possono trovare in commercio, è il "Melmac," ma poichè si consolida poco rapidamente è opportuno prima usare un gesso a presa normale rapida e quindi il melmac come strato esterno protettivo.

I sostituti del gesso, dunque, non devono essere usati d'abitudine, ma riservati per situazioni speciali, in vista della loro sensibilità, del loro ritardo di consolidamento, del loro costo e del più lungo tempo che richiedono per essere applicati e asciugati. Per gli usi correnti è meglio usare un buon gesso comune, a presa rapida, leggero e robusto come il "Gypsona®," che rimane ancora, a dispetto dei progressi compiuti nel campo delle sostanze plastiche, il materiale più utile per immobilizzare le fratture.

SUMARIO

Em uma procura constante para a substituição ou adição ao gessõ tradicional de "paris" para a imobilização do corpo e extremidades, quïmicos plásticos desenvolveram diversos materiais novos nas últimas duas décadas. Embora cada agente apresentado ofereça propiedades distintas e vantagens, o uso repetido demonstrou "handicaps" positivos que o restringem a situações especiais e o tornam indesejável para uso geral.

Quando se torna desejável banhar uma parte, como na hidroterapia de uma desordem neuropsiquiátrica em um paciente com fratura, ou quando o banho recreacional é urgentemente desejado (fratura em uma criança emocionalmente perturbada em um campo de verão), então o molde "Aire" é provàvelmente o agente de escolha, uma vez que é o que tem a menor probabilidade de se deteriorar com o umidecimento constante. Todo enchimento deveria ser tratado de maneira a conseguir certa repelência à agua, e o paciente deveria ser aconselhado a secar bem o molde após cada imersão. Esse molde só pode ser aplicado a fraturas sem deslocamento

ou quando jásse obteve união parcial com imobilização preliminar pelo gesso. Moldes impregnadas com resina melamina são de certo valor para tais propósitos, mas têm menos probabilidades de permanecerem intactos do que o material plástico de vidro.

O gesso impregnado com resina de melamina presta-se bem para o tratamento de criancinhas ou adultos incontinentes, nos quais o umidecimento repetido pela urina está apto para causar deterioramento, rachas ou constantes odores desagradáveis. Ö "Melmac" parece ser o produto mais satisfatório dêsse novo tipo agora viável, e será um acréscimo ao uso serviçal e eficiente de fôrmas em redor do peritôneo. Por causa de seu período de colocação ligeiramente retardado, pode se tornar aconselhável aplicar primeiro uma fôrma regular de colocação máis rápida ou a "Gypsona®" e depois colocar o "Melmac" ou um produto semelhante como um envólucro protector externo.

Em vista de sua sensibilidade relativamente maior, tempo retardado de colocação, custo maior, e mais tempo exigido para aplicação e secamento, os substitutos do gêsso não deveriam ser usados em rotina nas reservados para situações especiais. Para uso geral, um gêsso leve de "paris," forte, de colocação rápida, servirá como agente imobilizador ótimo na mão da maioria dos cirurgiões. A despeito dos inúmeros avanços recentes feitos no reino dos plásticos, o gêsso de "paris," talvez com o auxílio de refinamentos mais modernos, sendo o material mais valioso em geral para a imobilização do corpo e extremidades. Não parece provável que será completamente substituido.

ZUSAMMENFASSUNG

Die Kunststoffchemiker haben während der Suche nach einem Ersatz oder einer Verbesserung des zur Stillegung des Körpers oder der Gliedmassen gebräuchlichen Gipsverbandes in den letzten zwei Jahrzehnten verschiedene neue Stoffe herausgebracht. Alle diese Materialien haben ihre bestimmten Eigenheiten und Vorzüge. Bei wiederholter Anwendung zeigt sich jedoch, dass ihnen auch deutliche Nachteile anhaften, die ihre Brauchbarkeit auf bestimmte Spezialgebiete beschränken und sie zum allgemeinen Ersatz des Gipsverbandes als ungeeignet erscheinen lassen.

Wo das Baden bestimmter Körperteile besonders erwünscht ist wie z.B. bei neuropsychiatrischen Kranken, die hydrotherapeutische Behandlung brauchen und gleichzeitig einen Knochenbruch haben, oder wenn etwa im Falle eines emotionell gestörten Kindes mit einer Fraktur Schwimmen während der Sommerferien als Erfrischung von grossem Wert erscheint, bildet wahrscheinlich der "Aire-Cast"-Verband das Mittel der Wahl, weil dieses Material am wenigsten durch ständige Feuchtigkeit geschädigt wird. Das Polsterungsmaterial muss sorgfältig vorbehandelt werdem, um einen gewissen Grad der Wasserabstossungsfähigkeit zu erlangen, und der Patient muss angewiesen werden, den Verband nach jeder Bewässerung sorgfältig zu trocknen. Diese Art des Verbandes lässt sich nur bei Frakturen mit nicht verschobenen Bruchstücken oder in Fällen, wo durch vorangegangene Immobilisierung bereits eine partielle Heilung erfolgt ist, verwenden. Für derartige Zwecke sind mit Melaminharz getränkte Verbände von gewissem Wert; der aus Glas hergestellte Kunststoff scheint jedoch dauerhafter zu sein.

Mit Melaminharz getränkte Verbände eignen sich gut zur Behandlung kleiner Kinder oder erwachsener Patienten mit Harninkontinenz, wo der Verband einer Hüfte oder des ganzen Körpers der häufigen Benetzung mit Urin ausgesetzt ist und infolgedessen zerfällt, platzt und einen ständigen unangenehmen Geruch entwikkelt. Das beste zurzeit erhältliche Fabri-

kat dieser Art scheint "Melmac" zu sein. Es ist leicht anwendbar und wirksam bei Verbänden um die Bauchhöhle herum. Da "Melmac" längere Zeit zum Trocknen braucht, mag es ratsam erscheinen, es als äussere Schutzhülle über einen schneller trocknenden "Gypsona®"-Verband anzuwenden.

Wegen der grösseren Empfindlichkeit dieser Verbandstoffe, ihrer längeren Trocknungszeit, höherer Kosten und ihrer grösseren Anforderungen an die Zeit des Personals zur Anlage und Trocknung des Verbandes empfiehlt es sich, sie für besondere Gelegenheiten aufzuheben, anstatt sie routinemässig zu verwenden. In den Händen der meisten Chirurgen ist für den täglichen Gebrauch ein schnell trocknender starker Gipsverband leichten Gewichts, wie er sich im "Gypsoma"-Verband darbietet, das beste Material zur Immobilisierung. Trotz aller Fortschritte der jüngeren Zeit auf dem Gebiete der Kunststoffe bleibt der altbewährte Gipsverband—vielleicht mit einigen modernen Verfeinerungen—noch immer das auf umfangreichem Gebiet wertvollste Mittel zur Ruhigstellung des Körpers und der Gliedmassen, und es sieht nicht so aus, als ob er völlig durch etwas Anderes ersetzbar wäre.

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Modern scholarship and modern science reproduce the same limitations as dominated the bygone Hellenistic epoch, and the bygone Scholastic epoch. They canalize thought and observation within predetermined limits, based upon inadequate metaphysical assumptions dogmatically assumed. The modern assumptions differ from older assumptions, not wholly for the better. They exclude from rationalistic thought more of the final values of existence. The intimate timidity of professional scholarship circumscribes reason by reducing its topics to triviality, for example, to bare sensa and to tautologies. It then frees itself from criticism by dogmatically handing over the remainder of experience to an animal faith or a religious mysticism, incapable of rationalization.

—*Whitehead*

Otorhinolaryngologic Surgery

Carcinoma in Otolaryngologic Practice: Statistics

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THE expression of clinical experience in terms of numbers, equations and percentages is an attempt by the physician to translate medicine into a pure science. Though medicine is continually becoming more scientific, a large part of it remains art, judgment, intuition and inspiration. These qualities do not lend themselves to accurate assay and often confuse the presentation of facts.

At a meeting of the nation's largest society of otolaryngologists, members of a panel on carcinoma of the larynx indicated that the average duration of symptoms prior to diagnosis varies from eight to nine and one-half months. The institutions submitting these figures were geographically widely separated and handle a patient load with a relatively widespread economic status and possibly educational background. If these figures are accepted, it taxes one's credulity to accept the generally published 55 per cent rate of cure. At the institution I serve, confidence as to achieving a cure falls abruptly when symptoms have been present for over three and one-half months.

What does the 55 per cent "cure rate" represent? Is it 55 per cent of all patients whose condition is diagnosed as carcinoma of the larynx, or have those who have refused all therapy been culled from the total list?

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Does it include those who were given no therapy because they were *in extremis* or beyond the curative scope of surgical skill; those who elected radiation therapy or were referred to the radiotherapist because surgical intervention was not feasible? If 55 per cent represents the cures achieved in cases selected for operation, it has no meaning with reference to carcinoma; it merely indicates the surgeon's ability to select a suitable case. If he were sufficiently selective he could have a rate of cure of 100 per cent, but the death rate would mount accordingly.

Even if all statistics were based on the total number of cases in which a diagnosis of carcinoma of the larynx has been made, the results would be more interesting than informative. For greater scientific value, the figures on carcinoma of the larynx would require further division into (1) supraglottic carcinoma, (2) chordal carcinoma and (3) subglottic carcinoma. The site of the lesion occasionally influences the histologic picture and frequently affects the clinical course, the type of therapy employed and the prognosis.

Histologic interpretation is also a factor in the distortion of statistics. Although in a large percentage of cases carcinoma is unmistakable, there is a borderline group of cytologic variations that are benign or malignant according to the subjective

standards of the pathologist and the clinician. Examples of these are Bowen's disease, inverting papilloma, leukoplakia with metaplastic changes and that type of adenoma now recognized by some as acinic cell carcinoma.

Another factor that adds to the general confusion is the lack of agreement on classification. For example, lymphoepithelioma and undifferentiated cell carcinoma of the nasopharynx are considered epithelial tumors in the United States but are grouped with reticulum cell carcinomas by the Scandinavians. The manner in which a tumor is classified may materially alter the statistics when epidermal and mesodermal lesions are considered separately.

When one adds to all the foregoing considerations the fact that the person who presents the statistical material has a point to make, one must realize that, despite the best intentions and a strong effort to remain objective, he may still tend to interpret the data subjectively in order to support his argument.

What, then, is statistically acceptable in clinical practice? Certainly not the uncontrolled data amassed from the national and international literature. Perhaps, with reservations, one may accept the figures on progress in individual institutions where comparisons are limited to their own accomplishments as based on their own diagnostic and therapeutic standards. For example, in the past ten years at the University of Illinois our rate of cure expectancy of carcinoma of the maxillary sinus has risen from the generally published 32 per cent to about 51 per cent.

The improvement is due to several factors. Operations are more thoroughgoing than they formerly were. The Caldwell-Luc and Denker antrotomies have been discarded as inadequate in the definitive management of carcinoma; total or subtotal resection of the maxilla is now performed. In addition to encompassing more of the area, postoperative radiation therapy is almost invariably employed—whether teleradiation, contact radiation or interstitial radiation depends upon the indications in the individual case.

Perhaps the greatest factor in improving the results is the change of attitude. Participants in departmental tumor conferences consider the disease from the standpoint of total management rather than from the surgical aspect alone. From this more rational approach the training of the younger surgeons in the management of carcinoma has been augmented by the inclusion of radiation therapy. Whether or not they become radiotherapists is for them to decide, but they must be strongly aware of all the therapeutic possibilities if they are to function adequately. The splendid cooperation of the department of radiology in this plan has been most fortunate.

It has been said that "only one who can edit a book can read it intelligently." Those of us who are not editors and who do not know all the factors involved must be slow to accept at face value all statistics offered, regardless of the source.

SUMMARY

The author points out that the science of healing, medical or surgical, cannot be reduced to a so-called exact science by overuse of statistical data and exaggerated reliance upon the conclusions they suggest. There remain, and probably will always remain, large areas of both medicine and surgery in which the management of patients and the treatment of disease is far more an art than a science; sensibility, philosophy and human understanding are still urgently required.

The author therefore warns all practitioners of medicine and surgery that, although statistical surveys and the resulting tabulations of data have their place, they must not be allowed to supersede equally important, or more important, ele-

ments that enter into practice and professional judgment.

RÉSUMÉ

L'art de guérir, en médecine comme en chirurgie, ne peut être ramené à une prétendue science exacte par l'abus de données statistiques et par une confiance exagérée dans les conclusions qu'elles suggèrent. Il subsiste, et il subsistera sans doute toujours de vastes domaines médicaux et chirurgicaux où l'attitude à l'égard du malade et le traitement de la maladie sont bien plus un art qu'une science; la sensibilité, la philosophie et la compréhension de l'homme sont toujours une nécessité primordiale.

C'est pourquoi l'auteur met en garde médecins et chirurgiens: si les statistiques ont une valeur indéniable, il ne faut pourtant en aucun cas les substituer à d'autres éléments d'importance égale voire supérieure, et qui doivent entrer en ligne de compte dans tous les jugements du praticien.

SUMARIO

O autor chama a atenção para o fato de que a ciência de cicatrização, médica ou cirúrgica, não pode ser reduzida a uma tão chamada ciência exata pelo uso excessivo de dados estatíticos e dependência exagerada das conclusões que êstes sugerem. Existe e provàvelmente sempre existirá grandes áreas tanto da medicina como da cirurgia nas quais o manejo de pacientes e tratamento de moléstias é muito mais uma arte do que uma ciência; sensibilidade, filosofia e compreensão humana são ainda urgentemente exigidos.

O autor avisa portanto todos os que praticam a medicina e a cirurgia que, embora as pesquizas estatísticas e quadros de dados resultantes tenham seus lugares, não se deve permitir que êles anulem elementos igualmente importantes, ou mais importantes, que entram na prática e julgamento professional.

RIASSUNTO

L'autore ritiene che la scienza del guarire, medica o chirurgica che sia, non può essere considerata una scienza esatta e non deve diventarlo con l'abuso delle statistiche. Rimangono ancora, e forse rimarranno sempre, dei vasti campi della medicina e della chirurgia in cui la cura dei malati e delle malattie è più un'arte che una scienza e richiede senhibilità, filosofia e comprensione umana.

L'autore mette in guardia, pertanto, tutti coloro che si dedicano alla medicina dall'attribuire alle statistiche maggior importanza di quella che ad esse non competa e a non considerarle al di sopra della pratica e del giudizio professionale.

ZUSAMMENFASSUNG

Der Verfasser warnt vor der Gefahr, die Wissenschaft medizinischen oder chirurgischen Heilens durch übermässige Anwendung statistischer Daten und durch übertriebenes Vertrauen in die aus ihnen gewonnenen Schlussfolgerungen auf eine sogenannte exakte Wissenschaft einzuengen. Sowohl in der Medizin als in der Chirurgie gibt es noch immer und wird es wahrscheinlich auch in der Zukunft grosse Gebiete geben, auf denen die Behandlung der Kranken und der Krankheit weit mehr eine Kunst als eine Wissenschaft ist; Empfindungsvermögen, philosophische Haltung und menschliches Verständnis sind noch immer dringend erforderlich.

Der Verfasser rät daher allen, die Medizin und Chirurgie ausüben, sich nicht dazu verleiten zu lassen, durch statistische Beobachtungen und Tabellierungen, auch wenn diese ihren angemessenen Wert haben, wichtige Elemente ärztlicher Praxis und beruflicher Urteilskraft zu ersetzen,

Sinusitis: Radical Surgical Treatment

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JEFFERSON once stated that that government is best which governs least. In my opinion the same applies to surgery; i.e., that operation is best which least interferes with physiology and function.

For the antrum, I usually prefer a window type of operation and reserve the Caldwell-Luc procedure almost exclusively for foreign bodies, such as teeth, or the removal of cysts or polyps demonstrable by roentgen ray and lipiodol. I have practically abandoned operations on the ethmoid sinuses *per se*. When there are mucous polyps, I attempt to remove only a few at a time and permit healing to occur before removing more. This is done as an office procedure; no attempt is made to perform an elaborate and extensive removal at one sitting—a policy based on the prevention of massive scarring and resultant nasal dryness and crusting.

I have also found it practically unnecessary to operate on the sphenoid sinus. In general, soft tissue lesions such as edema and hyperplasia are reversible, and I do not advocate surgical intervention simply because of roentgen or clinical evidence of hyperplastic change.

Operation is usually indicated when there are extensive bony changes in the sinuses. These changes may be of two types. In the proliferative variety, which is the type most commonly associated with chronic sinusitis, there is condensing osteitis that tends to encroach upon and obliterate the lumen of the sinus. In some instances this becomes so extreme as to warrant the term "obliterative sinusitis." The second type of change is osteolytic. Osteolytic types include osteoporosis, or demineralization, and osteomyelitis. The latter is caused by infection of the cancellous bone and is characterized by the formation of sequestra. The acute fulminating type was once treated heroically by removal of all infected and potentially infected bone. With modern antibiotics available, I do not consider this radical exenteration justified. Antibiotics can limit the spread to new areas and change acute osteomyelitis into a localized chronic type of the disease, which can be treated by incision, drainage and removal of sequestra. When the lining of a sinus is stripped, there is regeneration of mucosa from the region of the duct and from areas of mucosa that have inadvertently been left. While this mucous membrane is growing into the sinus, proliferative changes of bone are also taking place. When the sinus is healed it will be much smaller than it was originally. If epithelium has been left, this may become incorporated in the bony and fibroblastic reaction and form mucoceles or pyoceles. I do not now remove all mucous membrane. Polyps and granulomas are removed, and cysts are saucerized. Edematous and thickened mucous membrane is left intact.

Spontaneous perforation of the anterior frontal plate does not necessarily mean the need for an obliterative type of operation, such as that advocated by Killian or Reidell. Drainage of the floor in such cases is quite successful. In cases in which there is injury of the frontal sinus, correction can be achieved by the use of

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bone grafts (cancellous bone from the ilium), diced cartilage, dermal grafts, acrylic plates or tantalum plates. It is impossible to insert grafts beneath thin atrophic scars. If these are present, suitable covering in the form of pedicle grafts must first be provided. I have used both cancellous bone grafts and diced cartilage to correct relatively small irregular defects, with success. For larger defects I prefer a plate, such as the tantalum plate.

It has been customary to employ intranasal procedures, such as submucous resection, infraction of the middle turbinate and removal of polyps, as prophylactic measures to prevent the recurrence of acute infection. It is my impression that none of these measures meets with much success because the main pathologic condition is in the nasofrontal duct, and this is not affected by the aforementioned procedures. There is certainly no objection to removing obstructive polyps or doing a submucous resection when a patient requires it for nasal respiration. That a narrowed nasal passage in the vicinity of the middle turbinate is a factor in frontal sinusitis can easily be disproved by the fact that as many or more instances of frontal sinusitis occur on the side where the nasal passageway is greatest, in cases of deviation of the nasal septum. Infraction of the middle turbinate will not affect the nasofrontal connection in any way. Any pus that is delivered beneath the middle turbinate will find its way out of the nose. It is the passage above this level that becomes obstructed in the presence of either acute or chronic sinusitis.

There are many operations for chronic frontal sinusitis. Intranasal procedures include rasping in the Halle type of intranasal ethmoidectomy and frontal sinusotomy. The classic type of external frontal sinus operation first described by Jansen and variously modified by Lynch, Sewall, Ferris, Smith, Luongo and others combines an external ethmoidectomy with removal of the floor of the frontal sinus. Throughout the years there has been a tendency to change from simpler to more extensive procedures. It is pointed out, however, that cure is often not obtained by even the most extensive fronto-ethmosphenoidectomy, because of excessive scarring and prolapse of periorbital tissue. With the more extensive procedures the morbidity rate—and often the mortality rate—is increased. In order to insure patency of the nasofrontal connection, I recommend first that the posterior superior nasal spine and adjacent tissue be not disturbed and that the opening into the sinus be made through the underlying ethmoid cells. Second, the maintenance of an intact bony wall on all sides of the frontoethmoid region, as advocated by Lathrop many years ago, will prevent subsequent cicatricial contraction. We are all aware of the ease with which a tracheotomy opening closes as soon as the cannula is removed, even though it has been in place for many weeks and is apparently completely epithelized. This is true of all soft tissue sinuses. If a bony ring is left, however, this collapse is not possible. The third important criterion is epithelization of the new nasofrontal connection. This is produced by inserting a 1 cm. tube covered with a full thickness graft of mucous membrane obtained from inside the cheek. The graft is sewed in place with the raw side outside. The donor site in the cheek is closed completely in a linear manner, and when healing is complete the scar can seldom be noticed. Skin grafts have been advocated for similar use, but I should like to warn against this procedure. Whenever mucous membrane and skin are mixed the skin becomes macerated and produces a foul, wet mess. I have seen this occur repeatedly in the orbit.

SUMMARY

The author presents his opinion as to the indications for radical operation on the

sinuses, stating that he has practically abandoned operations on the ethmoid and sphenoid sinuses *per se*. Removal of mucous polyps is done in successive stages as an office procedure. Soft tissue lesions such as edema and hyperplasia are reversible, and he does not consider operation justified merely because of clinical or roentgen evidence of hyperplastic change.

Various operations employed for treatment of the sinuses are mentioned, with the circumstances in which they can be used to advantage. In general, however, the author's attitude may be summed up in the statement that the best operation is the one that interferes least with the physiologic and functional status of the parts of the body operated on, which emphatically includes the sinuses.

RÉSUMÉ

L'auteur expose ses opinions quant aux indications chiurgicales radicales des interventions sur les sinus; il a pratiquement renoncé à opérer les sinus ethmoidaux et sphénoidaux *per se*. Il pratique l'ablation des polypes muqueux en plusieurs temps ambulatoirement, à son cabinet. Les lésions des parties molles telles que l'oedème et l'hyperplasie sont réversibles, et il ne considère pas l'opération comme justifiée du seul fait de l'évidence clinique ou radiologique d'une modification hyperplasique.

Diverses méthodes opératoires sont mentionnées, ainsi que les cas dans lesquels elles peuvent être utilisées avec profit. Mais d'une façon générale l'attitude de l'auteur peut se résumer ainsi: la meilleure opération — et cela est particulièrement valable pour les sinus—est toujours celle qui ménage au maximum l'intégrité physiologique et fonctionnelle.

SUMARIO

O autor dá sua opinião quanto às indicações para as operações radicais nos sinus, declarando que pràticamente abandonou as operações nos sinuses etmoideo e esfenoideo pròpriamente ditos. A remoção dos polipos mucosos é feita em estágios sucessivos como operação de consultório. Lesões de tecido mole tais como edema a hiperplasia são reversíveis e êle não considera a operação justificada apenas pela evidência clínica ou roentgenográfica da alteração hiplástica.

Várias operações usados no tratamento dos sinuses são mencionadas, com as ocasiões nas quais podem ser usadas com vantagem. Em geral, entretanto, a atitude do autor pode ser resumida na declaração de que a melhor operação é a que menos interfere com a parte funcional e fisiológica do corpo operado, o que enfàticamente inclui os sinuses.

RIASSUNTO

L'autore espone la sua opinione sulla cura radicale delle sinusiti, affermando di aver abbandonato completamente gli interventi sull'etmoide e sullo sfenoide *per sè*. I polipi mucosi vengono asportati in vari tempi; le lesioni delle parti molli, come l'edema e l'iperplasia, sono reversibili, e non vi è giustificazione all'intervento quando vi siano aspetti clinici o radiologici che facciano pensare soltanto a modificazioni ipertrofiche.

Vengono elencati i vari tipi di interventi chirurgici usati nella cura dei seni e le loro rispettive indicazioni. In generale, tuttavia, la tendenza dell'autore è di considerare buon intervento quello che meno interferisce con le funzioni della regione in cui si opera; e questo vale anche per i seni.

ZUSAMMENFASSUNG

Der Verfasser gibt eine Darstellung seiner Beurteilung der Indikationen zur radikalen Operation der Nasennebenhöhlen und berichtet, dass er die Operation der Siebbeinzellen und der Keilbeinhöhle

per se praktisch aufgegeben hat. Schleimhautpolypen werden in aufeinanderfolgenden Sitzungen in der Sprechstunde entfernt. Gewisse Weichteilveränderungen wie Ödem und Hyperplasie sind rückbildungsfähig, und der Verfasser hält einen operativen Eingriff nicht für gerechtfertigt, nur weil klinische oder röntgenologische Anzeichen hyperplastischer Veränderungen vorliegen.

Es werden verschiedene zur Behandlung der Nebenhöhlen angewandte Operationen und die Bedingungen, unter denen sie sich mit Nutzen ausführen lassen, erwähnt. Im allgemeinen aber lässt sich der Standpunkt des Verfassers dahin zusammenfassen, dass die beste Operation die ist, die am wenigsten die physiologischen und funktionellen Aufgaben des Körpers, und die Nebenhöhlen der Nase sind dabei selbstverständlich nicht ausgeschlossen, beeinträchtigt.

The working programme of a surgeon shows how much energy could be taken out of the human organism. The Mayo brothers were generally in their operating theatre by 7:30, and Harvey Cushing after breakfast at 8:00, was driven over to the hospital. While the chauffeur drove on to school with the Cushing children, their father was in his hospital office, attending to correspondence. He remained thus for about two hours occasionally eating buttered toast, and was ready to commence his operations by about eleven o'clock.

There followed lengthy, meticulous and laborious hours. Few people who picture the glamorous lives of great surgeons could face the strain of sitting in a darkened and moist room, working with deft touches of fingers at the bottom of a cavity a few inches across, patiently arresting the blood from tiny arteries, handling everything with prodigious delicacy, never hurrying, hardly ever relaxing, each faculty strained upon that narrow field which is the interior of a human skull brightly illuminated from an electric lamp fastened to the operator's forehead. For three or four hours this must go on, silently, with every moment deliberately keyed down so as to be quite undramatic; yet behind it is the human life at stake, and in consequence the emotions of the operator can never run cold. He must give of himself all the time, never allow his attention to wander, must keep a look-out for all possible danger signs, while the team of six or eight assistants who are in the theatre have to be directed by his responsible brain.

—*Williams*

Plastic and Reconstructive Surgery

Recent Trends in Surgical Treatment of the Cleft Palate

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IN the surgical repair of alveolar and postalveolar clefts of the palate, the goal is separation of the oronasal cavities, improvement of respiration, deglutition, oronasal hygiene and provision of a mechanism for normal speech. At the same time, of course, the aim is for good anatomic relations.

The first operations for correction of these abnormalities were performed very late in the eighteenth and the early part of the nineteenth century. The vast literature on the subject of surgical correction of cleft palate is evidence that many of the problems connected therewith have not yet been solved. This is not surprising when one realizes the infinite variations in type and the multiplicity of factors involved.

An objective of operative treatment is complete closure of the cleft, if possible, but more particularly the provision of a mechanism by which the nose can be shut off from the mouth. Regardless of a perfect anatomic result, no operation for closure of the cleft that fails in this, and does not prevent leakage of air into the nose during phonation, can be called a success. As yet, however, no procedure has been devised that will always assure this result.

Another primary objective of closure is the formation of a velopharyngeal sphincter. If this cannot be accomplished by the operative procedure, the validity of the operation is questionable.

Some surgeons in the past exhibited completely closed defects, expending much time and ingenuity on ways and means of achieving such results. Today, if the patient can snort and carry out blowing tests that indicate efficient control of the oronasal sphincter, the operation, in my opinion, has accomplished its purpose.

In early operative procedures defective speech was only slightly improved, from operations that shifted the tissues to the midline, with subsequent scar contraction, to a palate already short. Examples of this were operations devised by Dieffenbach[1] and von Langenbeck,[2] who employed the use of advancement flaps of mucoperiosteum for repairing clefts of both the hard and the soft palate. Davies-Colley[3] suggested an epithelial lining for the flaps of the palate. The use of osteoplastic flaps was suggested by Wutzer.[4] Closure of the alveolus by forcible compression of the bones was recommended by Brophy.[5] These and other procedures succeeded in securing anatomic closure and some improvement in deglutition, respiration and

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oral hygiene, but they did little to improve speech inadequacies.

The chief reason for closing the palate is to make good speech possible, but if the soft palate is not long enough or sufficiently mobile to prevent the passage of air to the nose, the achievement of good speech is improbable. Since its inception, palatal surgical intervention has been constantly directed toward overcoming this failure. Numerous procedures have been employed to lengthen the palate, on the theory that a defect of speech in the patient with cleft palate is caused by the anteroposterior shortness of the palate or by increased pharyngeal dimensions.

Methods were devised to lengthen the palate in its anteroposterior dimensions; to bring forward the postpharyngeal wall, and to reduce the circumference of the pharynx. It was hoped that better closing of the pharynx would result in better speech. Technics were also devised by Schoenborn,[6] Blasius,[7] Meyer,[8] Blair and Ivy[9] and others, to lengthen the palate by adding tissue in the form of flaps from the pillars of the tonsils, the cheek and the posterior pharyngeal wall, and by the use of extraoral tissues.

Another method was the use of a pharyngeal flap taken from the postpharyngeal wall and attached to the posterior surface of the velum. The primary intention of this was to lengthen a short palate, to close off the nasopharynx during phonation and to close wide clefts previously operated on. A difficulty in this procedure was the smallness of the area in which operation had to be performed. It was found, however, that this could be overcome by doing a preliminary tracheotomy.

Other procedures were advocated by Veau,[10] Axhausen,[11] Brophy[12] and others. All, however, had one common defect: the palate was too short for the desired result: functionless tissue interfered with mobility of the palate, and speech was not improved. Hence, more radical procedures were devised.

In an effort to correct the disappointing results of using extrapalatal tissues for lengthening, Dorrance[13] designed and popularized the "pushback operation" for posterior displacement of the entire palate. This was based upon the principle of the delayed flap developed by Blair[14] and later modified by Browne,[15] who preserved the palatine arteries in posterior displacement.

Other schools of thought advocated bringing the postpharyngeal wall forward to meet the shortened palate, by such means as the introduction of paraffin into the submucosa of the posterior pharynx,[16] the introduction of fat, fascia and cartilage grafts,[17] and reefing of the mucous membrane of the pharynx itself.[18] Today these procedures are rarely used, if at all.

Various forms of pharyngoplasty were advocated for reduction of the circumference of the pharynx, such as excision of elliptic sections[19] and reduction of electrocoagulation.[20] Wardill[21] performed an operation designed for the posterior and lateral walls of the pharynx. This procedure was an attempt to decrease the width of the pharynx laterally and increase the bulk of Passavant's cushion on the posterior pharyngeal wall. These operations for a complete cleft failed to accomplish their purpose, increased the risk and entailed additional operations.

No description of specific operative technics currently employed will be included here, since, although there were innate defects in some of the older methods, such as those of Dieffenbach and von Langenbeck, some of the salient principles of their operations have stood the test of time as standard procedures. Advances in surgical treatment of the palate have consisted largely in improvement and modifications of these technics, aimed toward better anatomic results and, indirectly but significantly, the achievement of improved speech. Moreover, within recent years,

surgical technics for the treatment of cleft palate have been improved to such an extent that they are now fairly well standardized.

Optimum Time for Operation. — The question of when to close the palate has been somewhat controversial. The more consistent recent trend, however, has been to close the cleft when the patient is approximately 18 months to 2 years old. At the turn of the present century the palate was closed after the child had learned to talk. This practice was based upon the theory that a relatively large amount of tissue was present in proportion to the cleft, that the alveolus had closed to some extent and that the arch of the palate was relatively high.

This idea was later discarded in favor of the theory that habits formed by the tongue were abnormal in the unclosed cleft, producing speech that was imperfect and uncorrectable when the palate was closed at a later date. Many authors, including Lane[22] and Brophy[23] considered that the earlier the palate was closed the better the function that could be obtained, therefore, Lane closed the palate as soon after birth as the infant could tolerate an operation.

According to Slaughter and Brodie,[24] this was based upon the desire to separate the nasal and oral cavities so as to favor the development of normal breathing habits; to prevent the return of food through the nose; to facilitate feeding; to establish normal physiologic aeration of the nose to assure development; to minimize middle ear infection, and to improve the appearance of the face. Although some of these objectives were attained, Slaughter and Brodie pointed out the number of poor cosmetic and functional results of this therapy at puberty.

During the past decade, attention has been called to the growth of the child's head and face from the time of birth. Interest has been directed toward the serious deformities resulting from surgical intervention and the consequent disturbance of bony growth. After initial closure of the palate shortly after birth, many children had to undergo additional operations to keep the closure intact. Likewise, as the child matured, there were speech defects, as well as oronasal, pharyngeal, and other disturbances. Slaughter and Brodie were able to demonstrate that operation can and does inhibit normal growth, and that this disturbance is directly proportionate to the amount of injury and diminution of the blood supply to the parts concerned. These authors emphasized the fact that palatal operations, poorly timed and poorly done, eventually do more harm than good.

Makuen[25] expressed the opinion that speech impressions and habits are developed early in the second year and that the most serious imperfections of speech are acquired in the formative period.

Veau advocated closure of the palate between the ages of 10 and 20 months. His reported mortality rate for closures in the first year was 9 per cent, with normal speech in 70 per cent of cases. For closures in the second year the mortality rate was 5 to 6 per cent, with normal speech in 69 per cent of cases. In the third year there was no mortality, and normal speech was obtained in 25 per cent of cases.

As a rule I have followed the plan of closure of the palate between the ages of 14 and 18 months, provided the general health of the child is within normal limits. Exceptions are made with partial clefts, which I close earlier, and bilateral clefts, which I close later. The hard and soft palates are usually closed in one operation. Widely separated clefts, however, which require two or more operative procedures, are done when the child is more than 18 months old.

Prosthesis versus Operation.—Reparative and reconstructive work on the palate must be considered from the functional, esthetic and psychologic points of view.

It is often advisable to use a prosthesis as a substitute for operation, not as an adjunct to it. The question will arise whether the palate should be repaired by operation or by artificial means. There are a number of factors that influence this decision: 1. The condition of the child may be such that operation is inadvisable. 2. With regard to adult patients, some cannot afford the time and money for hospitalization and operation and decide instead on a mechanical speech appliance. 3. Some surgeons will decide on a mechanical separation of the oronasal cavity rather than an operative procedure. Most patients, however, or parents of young patients, are better satisfied with a palatal operation, in spite of the fact that the esthetic results of a prosthesis may be better. The psychic effects of surgical repair are much superior to the state of mind induced by a prosthesis, because of the problem of replacement and repair of the prosthetic appliance and the renewals necessitated by the alterations of growth.

Tissue that is scarred and contracted does not make a good base upon which to place a prosthesis. Edematous tissue is a contraindication for making the necessary casts. Proper construction of a prosthesis, therefore, requires the close cooperation of the prosthodontist (who constructs the prosthesis) and the surgeon.

Speech and Rehabilitation.—Today it is recognized that considerations other than surgical enter into the problem of rehabilitation of the patient with a cleft palate, who may well be termed a "cripple." After the palate is closed, care of the child does not stop, because normal speech and psychic rehabilitation are essential objectives of closure.

Veau estimated that, after operation, normal speech occurs in 27.8 per cent of patients and improved speech in 47 per cent. These poor results cannot be attributed entirely to operative reconstruction of the palate. The intellect and determination of the patient are often the decisive and contributing factors in good phonation, for good enunciation may be observed after an ineffectual repair and, at times, poor phonation with an excellently repaired palate. Poor phonation in a well-repaired palate indicates a cranial disturbance or a cerebral change over which the surgeon has little, if any, control.

A very high percentage of patients with cleft palate, even with the best possible surgical closure, require orthodontia and speech training. Many patients with repaired palates, even without speech training, will achieve excellent speech. On the other hand, many show poor anatomic and functional results from the standpoint of speech, even with extensive speech training. It is in the latter group that proper pretherapeutic evaluation might avoid results embarrassing to the patient and the surgeon and prevent difficulties with other forms of treatment.

Although a successful velopharyngeal closure has been accomplished, the child, by the time closure is performed, may have acquired some habits that require reeducation to overcome. For older patients the outlook for normal speech after the operation is less promising than for those below the age at which speech begins. Repair after speech has developed requires that the patient overcome wrong methods of breathing, as well as faulty habits and speech patterns.

Statistics on the high incidence of cleft palate pose an important problem. Because of numerous factors involved in rehabilitation, however, other than surgical correction and functional restoration, cleft palate clinics are being established in various parts of the United States and staffed by representatives of the various specialties interested in the patient with this problem. These teams are made up of the surgeon, the dentist and orthodontist, the prosthodontist, the otolaryngologist, the pediatrician, the speech therapist, the psy-

chologist and the social worker. Many coworkers, such as the histologist, the pathologist, the anatomist, the embryologist, and the geneticist, are also called in for help and consultation. Each patient is seen by the entire group after the initial closure of the lip, which, in most instances, has been performed as early in life as practical. By means of this consultation among an interprofessional group, a cooperative system of planning for the treatment and rehabilitation of each child is arrived at, and therapy is prescribed which is best suited to the solution of the individual problem.

SUMMARY AND CONCLUSIONS

Trends and progress in the surgical treatment of cleft palate from its inception are presented. The failures and shortcomings of some of the earlier methods of operation and the satisfactory elements of certain others are discussed, with reasons for their end results.

It is pointed out that some of the salient principles of some well known operative procedures of the past, with modifications and improvements, are currently still used in operations for cleft palate surgery, which today are fairly well standardized.

Nevertheless, the future development and further improvement of the surgical treatment of this condition is dependent upon an agreement upon the fundamental principles of repair of this deformity. Much research and study is now being done, and much will be required, to achieve the goal of perfect anatomic, functional and cosmetic closure, with good speech.

An important step in this direction has been the recent establishment of cleft palate clinics, staffed with representatives of the various specialties. This interprofessional cooperation greatly enhances the pretreatment evaluation of the prognosis and the efficiency programs for therapy and speech training.

RÉSUMÉ ET CONCLUSIONS

Les tendances et les progrès du traitement chirurgical de la fissure du palais sont passés en revue. Les échees et les mauvais résultats de quelques méthodes opératoires, les résultats satisfaisants de certaines autres sont discutés.

Quelques-uns des principes essentiels d'anciennes techniques modifiées et améliorées sont encore en usage. Le traitement chirurgical des fissures du palais est aujourd'hui assez unifié. Mais des progrès ne pourront être accomplis que par une entente sur les principes fondamentaux des modes de traitement de cette malformation. De nombreuses études seront encore nécessaires avant d'obtenir des résultats anatomiques, fonctionnels et cosmétiques parfaits avec une bonne phonation.

Une innovation heureuse est l'établissement de cliniques spécialisées où travaillent des spécialistes divers. Cette collaboration interprofessionnelle augmente la valeur du traitement pré-opératoire, elle permet un meilleur pronostic et une plus grande efficacité des programmes thérapeutiques et de rééducation de la parole.

CONCLUSIONI RIASSUNTIVE

Vengono tratteggiati i progressi e le tendenze nella cura della palatoschisi, gli insuccessi di alcuni metodi antichi e i successi di altri metodi, e le ragioni dei risultati.

Alcuni dei principi basilari di certi metodi antichi sono ancora comunemente applicati oggi giorno con opportune correzioni e modifiche; tuttavia lo sviluppo futuro e gli ulteriori perfezionamenti di questa chirurgia dipendoo da alcuni principi fondamentali. Studi e ricerche sono tuttora in atto allo scopo di distabilire quale sia il metodo che consente una chiusura anatomica perfetta e un perfetto risultato estetico e funzionale.

Un passo importante in questo senso si è fatto con la creazione di reparti specializzati per la cura della palatoschisi, in cui lavorano rappresentanti di ogni specialità. Questa collaborazione è molto valida nella valutazione preoperatoria, nella scelta del programma di cura e nella rieducazione del linguaggio.

SUMARIO E CONCLUSOES

Técnicas e progressos no tratamento cirúrgico da fissura palatina são apresentados. Os fracassos e detalhes de alguns dos primeiros métodes e os elementos satisfatórios de certos outros, são discutidos, com razões para os seus resultados finais.

Salienta-se que alguns dos princípios salientes de alguns métodos operatórios bem conhecidos do passado, com modificações e melhoramentos, são ainda correntemente usados nas operaçãoes para a cirurgia da fissura palatina, que estão hoje em dia bastante padronizadas.

Entretanto, o futuro desenvolvimento e melhoramento posterior do tratamento cirúrgico dessa condição depende do concordância sôbre os princípios fundamentais do reparo desta deformidade. Muita pesquiza e estudo estão sendo feitos hoje em dia, e muito ainda se precisará fazer para se alcançar o "goal" de perfeito fechamento anatômico, funcional e cosmético, com boa fala.

Um passo importante nessa direção foi o estabelecimento decente de clínicas de fissuras palatinas, equipadas com representantes das várias especialidades. Esta colaboração interprofissional permite grandemente a avaliação do prognóstico antes do tratamento e a eficiência de programas para a terapia e treino da fala.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Es werden die Tendenzen und Fortschritte in der chirurgischen Behandlung des Wolfsrachens seit ihren Anfängen dargestellt. Die Versager und Nachteile mancher älterer Operationen, die befriedigenden Grundlagen anderer Operationen und die Gründe für die Endergebnisse werden erörtert.

Es wird darauf hingewiesen, dass einige der wichtigsten Grundsätze mancher wohlbekannter Operationsverfahren der Vergangenheit noch heute mit gewissen Abänderungen und Verbesserungen in der chirurgischen Behandlung des Wolfsrachens, die zurzeit ziemlich gut standardisiert ist, Verwendung finden.

Nichtsdestoweniger hängt die künftige Entwicklung und weitere Verbesserung der chirurgischen Behandlung dieser Erkrankung davon ab, dass man sich über die fundamentalen Grundsätze der Reparatur dieser Missbildung einigt. Auf dem Gebiete der Forschung wird augenblicklich viel getan, und mehr noch wird getan werden müssen, um das Ziel einer Schliessung der Spaltbildung mit fehlerlosen anatomischen, funktionellen und kosmetischen Ergebnissen und mit guter Sprechfähigkeit zu erreichen.

Einen wichtigen Schritt in dieser Richtung bildet die kürzliche Eröffnung von Wolfsrachenkliniken, deren Stab sich aus Vertretern verschiedener Spezialitäten zusammensetzt. Eine solche interprofessionelle Zusammenarbeit erhöht den Wert der Prognose vor der Behandlung sehr erheblich und verstärkt die Wirksamkeit der Pläne zur Behandlung und Sprachbildung.

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It is the first step in sociological wisdom, to recognize that the major advances in civilization are processes which all but wreck the societies in which they occur:—like unto an arrow in the hand of a child. The art of free society consists first in the maintenance of the symbolic code; and secondly in fearlessness of revision, to secure that the code serves those purposes which satisfy an enlightened reason. Those societies which cannot combine reverence to their symbols with freedom of revision, must ultimately decay either from anarchy, or from the slow atrophy of a life stifled by useless shadows.

—*Whitehead*

Megacolon: Treatment By Rectosigmoidectomy

Report of Two Hundred Consecutive Cases

DAHER E. CUTAIT, M.D., F.I.C.S.*

SAO PAULO, BRAZIL

RECTOSIGMOIDECTOMY is at present considered the best operative method for the treatment of megacolon. Statistics of experienced authors show that the operations commonly performed until some years ago, such as sigmoidectomy, sympathectomy and pelvirectal or internal anal sphincterectomy, did not yield satisfactory results, considering the large number of patients not benefited and the numerous recurrences following such operations.

Statistics concerned with treatment by rectosigmoidectomy, on the contrary, show cure of the disease in almost all patients. This obviously accounts for the current preference for this surgical procedure by surgeons of the main medical centers all over the world.

This paper is concerned with the experience obtained from 200 cases of acquired megacolon treated by this operative method at the 3a. Clínica Cirúrgica do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (Profs. B. Montenegro and Alipio Corrêa Netto) from May 1947 to April 1956. Sixty-eight patients were subjected to abdominal rectosigmoidectomy and 132 to abdominoperineal rectosigmoidectomy. One hundred and twenty-six were male and 74 were female. The age distribution was as follows:

Age, Years	*No. of Cases*	*Percentage*
11-20	5	2.5
21-30	57	28.5
31-40	68	34
41-50	48	24
51-60	17	8.5
61-70	4	2
71-80	1	0.5
Total	200	100

Pathogenic Basis.—Abdominal rectosigmoidectomy was first performed on the pathogenic basis of achalasia of the pelvirectal sphincter. According to this theory, dilatation of the sigmoid colon would result from an obstacle caused by lack of relaxation of the sphincter at the moment of evacuation of the bowels, as a consequence of inflammatory lesions of Auerbach's mienteric plexus. Resection of the rectosigmoid segment as well as of the dilated sigmoid, followed by a low rectocolic anastomosis, should, as was pointed out by Corrêa Netto,[1] cure the patients.

Abdominoperineal rectosigmoidectomy was performed on the pathogenic basis of dyskinesia of the distal portion of the intestine. According to this pathogenic theory, dilatation of the sigmoid colon would result from lack of propulsive ca-

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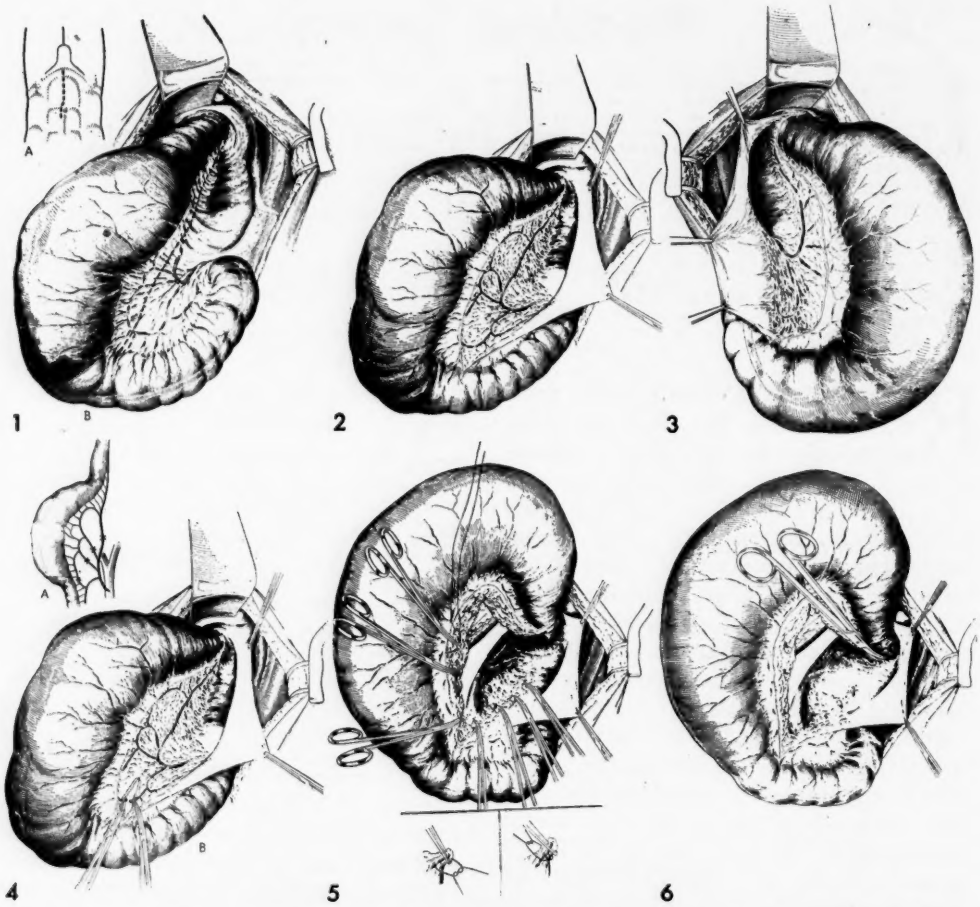
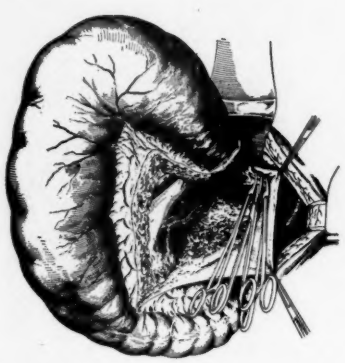


Figs. 1 to 6.—*1*, median suprapubic incision *A*, (inset), with cephalad left prolongation. *B* (main drawing), sigmoid delivered out of incision. Dotted line shows the trajectory of the incision of the right peritoneal sheet of mesosigmoid. Right ureter well individualized. *2*, right mesosigmoid peritoneal sheet incised and radicular lip dissected in an extension of about 3 cm. *3*, left mesosigmoid peritoneal sheet incised and radicular lip dissected in an extension of about 3 cm. *4*, levels of ligature of mesosigmoid vessels (*A*, inset), Drummond arcade sigmoidal and superior hemorroidal vessels. *B*, clamping and division of vessels, which are well individualized. *5*, ligature by transfixion of mesocolic vessels. *6*, posterior dissection of rectum.

Figs. 7 to 15 *(opposite)*.—*7*, division of middle hemorrhoidal vessels. *8*, final aspect of the mobilized sigmoidorectal segment. *9*, division of proximal sigmoid and rectum, after clamping with modified Wertheim clamps. *10*, sigmoidal and rectal stumps prepared for anastomosis. *11* and *12*, sigmoidorectal anastomosis in two rows of interrupted sutures, one total and another seromuscular. *13*, pelvic floor reconstructed. Drainage of presacral space with Penrose drain, which emerges from distal end of pelvic peritoneal suture. *14*, final aspect of the operation. The drain is delivered out from the distal end of the incision. Transverse colon exteriorized, to be opened twenty-four to twenty-eight hours later. *51*, final aspect of the operation, in a sagittal section. Low extraperitoneal sigmoidorectal anastomosis. Penrose drain in presacral space.



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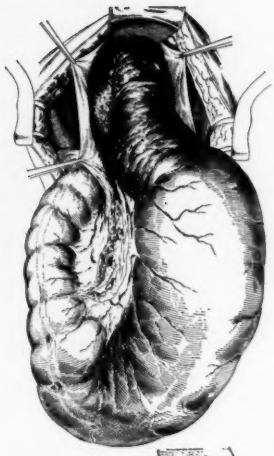

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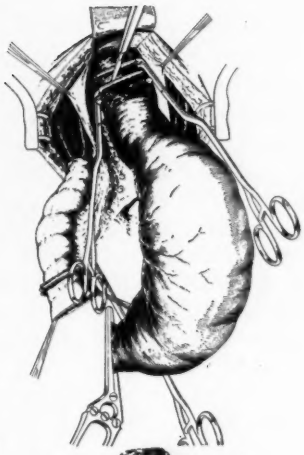

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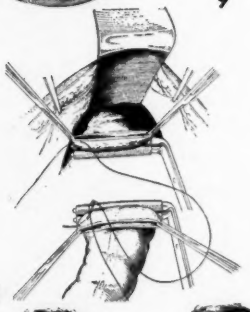

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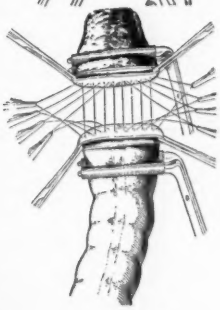

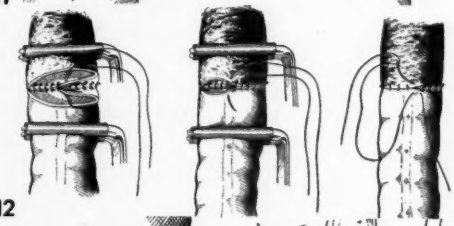

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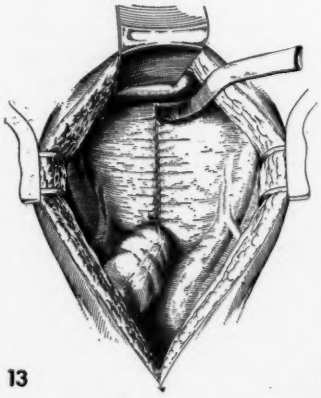

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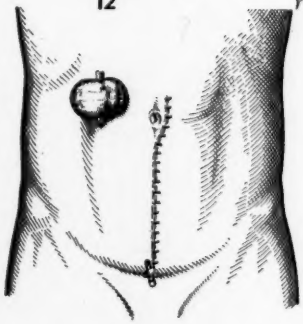

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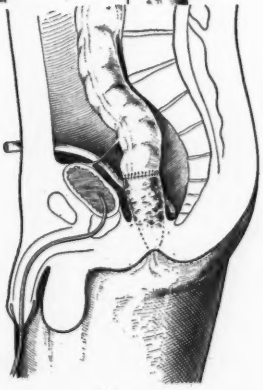

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pacity of the rectum and sometimes also of the sigmoid flexure, due to defective contraction of its muscular fibers caused by an inflammatory lesion with partial or total destruction of Auerbach's mienteric plexus. Resection of the diseased intestine as well as of the dilated colon should obviously cure the patient. As the operation is technically easier than abdominal rectosigmoidectomy and involves resection of a larger portion of the rectum, it has been used almost routinely.

It is my present opinion, after studies made in my country, that dyskinesia explains the pathogenesis of megacolon much better than does achalasia of the pelvirectal sphincter. The presence of this sphincter was recently denied by Prata,[2] who, in an exhaustive paper, demonstrated that there is no sphincteric anatomic structure in the pelvirectal region. At present, then, I perform rectosigmoidectomy, either abdominal or abdominoperineal, on the sole basis of the theory of dyskinesia of the distal portion of the intestine. I may mention that neither of these operations can be considered quite radical, because the lesions of the mienteric plexus always extend down to the anocutaneous juncture. As the rectocolic anastomosis is made some centimeters above this level, a segment of diseased intestine is obviously not removed. In spite of this fact, however, satisfactory results have been obtained with these operations, as I shall demonstrate later.

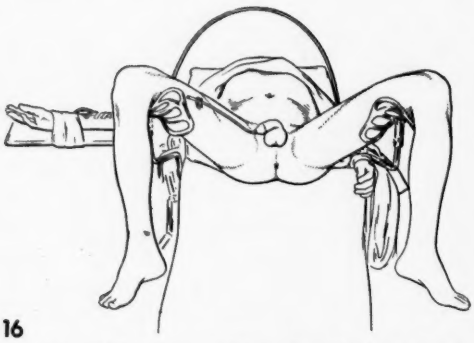

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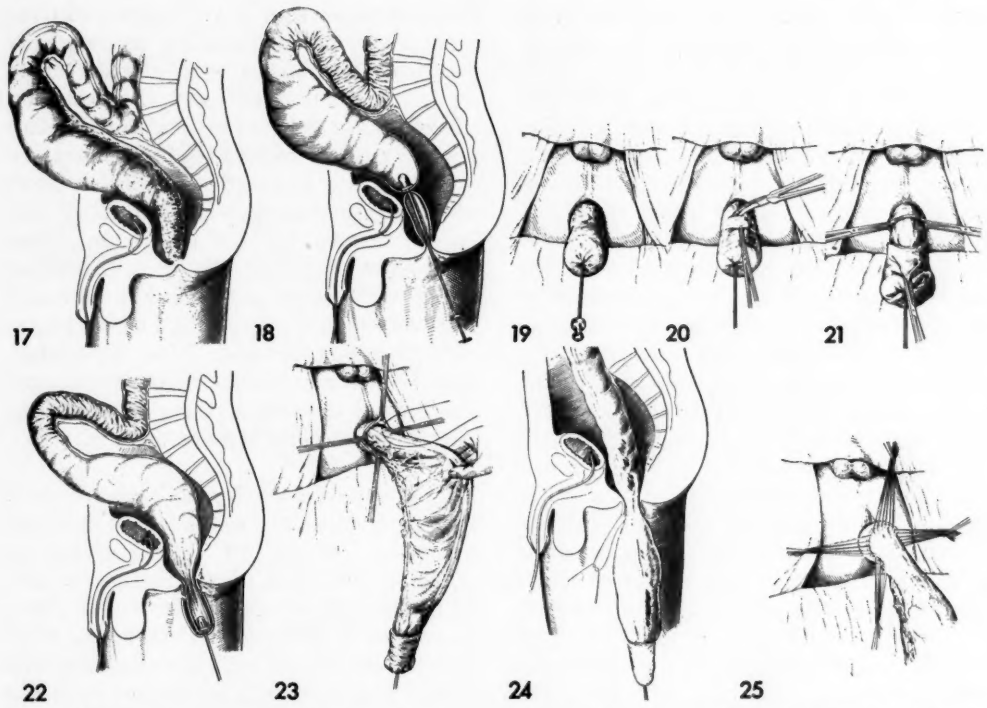
Fig 16.—Lithotomy position of patient on operative table. Moderate flexion of legs to pelvis.

Technic. — Abdominal rectosigmoidectomy: The technic I use for abdominal rectosigmoidectomy is similar, in a general way, to that of the anterior resection proposed by Dixon[3] and Wagensteen[4] for cancer of the rectum and rectosigmoid (though obviously without its inclusion of a wide resection of the mesocolon and the perirectal tissue, since I am not dealing with malignant disease).

After a large midline or left paramedian suprapubic incision has been made, the dilated sigmoid portion of the colon is delivered out of the abdomen. The patient is placed in the Trendelenburg position, and the mesosigmoid is incised on both sides, from a level slightly proximal to the dilated sigmoid flexure down to the peritoneal reflection (Fig. 1). Both the right and the left peritoneal radicular lip are then dissected free to the extent of about 3 cm., in order to facilitate the ultimate reconstruction of the peritoneal floor (Figs. 2 and 3).

The Drummond arcade and the sigmoidal and superior hemorroidal vessels are clamped, divided and ligated (Figs. 4 and 5). The rectum is dissected posteriorly (Fig. 6) down to the tip of the coccyx, anteriorly through Denonvilliers' space in the male or the rectovaginal space in the female to a corresponding level, and laterally. The middle hemorroidal vessels are clamped, divided and ligated (Figs. 7 and 8). Dissection is carried on close to the wall of the rectum, in order to minimize lesions of the autonomic nerves.

The colon and rectum are then divided, after protection with special personally modified Wertheim's clamps (Figs. 9 and 10). Division of the rectum is made as far distal as possible, at a level, however, that allows the safe performance of rectocolic anastomosis. This is done with two rows of interrupted cotton sutures (Figs. 11



Figs. 17 to 25.—*17*, sigmoidorectal segment dissected down to the anus. Stitch shows level of sigmoid to be divided at the perineal stage of the operation. *18*, obturator of a sigmoidoscopic tube introduced through anus and fixed at proximal level of rectum by a heavy silk ligature. *19*, rectum everted after traction on the tube. *20*, incision of rectal wall. *21*, incision of rectal wall completed. *22*, schematic sagittal aspect, showing rectum everted and incised. *23*, sigmoid pulled out through anus up to level previously marked with a cotton stitch. *24*, schematic sagittal aspect of Figure 23. *25*, first row of sutures. Stitches applied to muscular coat of everted rectum and seromuscular coat of sigmoid.

and 12). It demands skill and patience on the part of the surgeon, as it is performed deep in the pelvic cavity.

Drainage of the presacral space is done with a Penrose drain, and the peritoneal floor is reconstructed with a continuous suture (Fig. 13). The rectocolic anastomosis remains extraperitoneal.

After a transverse colostomy has been performed through a stab wound made to the right and slightly above the umbilicus, the abdomen is closed. The Penrose drain is delivered out at the distal end of the surgical incision (Fig. 14).

Figures 1 to 15 show the different steps of the operation.

2. *Abdominoperineal Rectosigmoidectomy:* The patient is placed on the operating table in the lithotomy position, with moderate flexion of the legs to the pelvis (Fig. 16). After the abdomen has been opened, dissection of the sigmoid flexure and the rectum is carried on in a manner similar to that described for abdominal rectosigmoidectomy, with the difference that it is continued down to the level of the anal elevator muscles (Fig. 17). The proposed level of division of the sigmoid, to be made at the perineal stage, is marked with a cotton stitch applied to its mesenteric aspect.

The perineal stage of the operation is

started by introduction of the obturator of a sigmoidoscopic tube through the anus up to the proximal limit of the rectum. After being fixed at this level with a heavy silk ligature (Fig. 18) by an assistant who has remained in the abdominal area, the obturator is subjected to gentle traction and the rectum thus turned inside out (Fig. 19). This maneuver easily effects complete eversion or intussusception of the entire rectum and the lower segment of the sigmoid flexure through the anus.

The rectal everted wall is grasped with an Allis clamp, and an incision is made with scissors all around it, at a level approximately 2 to 3 cm. from the pectinate line (Figs. 20, 21 and 22). The sigmoid is then pulled out through the anus, up to the level previously marked by the cotton stitch (Figs. 23 and 24). Drainage of the presacral space is then carried out by means of a No. 30 rubber tube drain, which is delivered to the perineum through a stab wound made at the anococcygeal line.

Rectocolic anastomosis is performed in two rows of interrupted cotton sutures. In the first, the stitches are applied to the muscular coat of the everted rectum and the seromuscular coat of the sigmoid (Fig. 25). In the second, made after division of the sigmoid just distal to the first row of sutures (Fig. 26), the stitches are applied to all coats of the rectum and sigmoid (Fig. 27). Upon completion of the anastomosis, the rectum is pushed up through the anus with the finger (Figs. 28 and 29).

While the anastomosis is being done at the perineum, the assistants who have remained at the abdominal field reconstruct the pelvic peritoneal floor, perform the transverse colostomy and close the surgical wound.

Figures 16 to 30 show the different steps of the operation.

The technic of abdominal rectosigmoidectomy employed in my series was the one aforedescribed. In some cases the operation was performed in two stages: (1) resection of the dilated sigmoid flexure, with exteriorization of the two sigmoid stumps in the surgical wound, and (2) resection of the remaining sigmoid and rectum, followed by a low rectocolic anastomosis. In 3 cases, owing to technical difficulties, left proctohemicolectomy was performed, followed by anastomosis of the rectum to the transverse portion of the colon. Proximal colostomy was not performed in 35 cases, most of which were observed at the beginning of my experience. After unsatisfactory immediate postoperative results had been noted in some of these cases, it was decided to perform the operation as a routine.

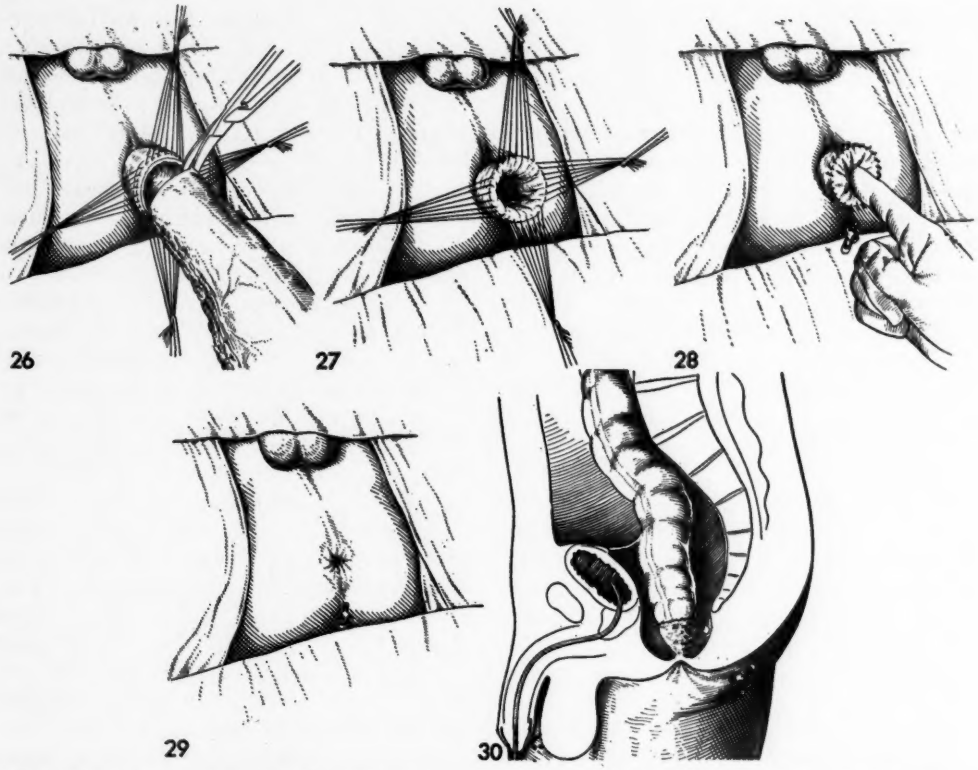
The technic used for abdominoperineal rectosigmoidectomy was also the one here described, or that of Corrêa Netto[5] in which the division of the rectum is done in the abdominal stage. The rectal stump is everted in the perineal stage; the colon is delivered out through the anus, and rectocolic anastomosis is performed with two rows of sutures.

Tactics.—The surgical tactics followed in this series varied with the problems presented by the patients, both at the moment of first encounter and on the basis of experience progressively acquired in the handling of the disease.

I shall not report the orientation followed in all the cases; rather, I shall describe only my present policies.

In uncomplicated cases the operation is performed in two stages: (1) rectosigmoidectomy and transverse colostomy, and (2) closure of the colostomy, which is done two or three weeks later. If sinus or disruption of the rectocolic anastomosis develops, the closure is postponed until one is quite sure that it has healed, which occurs in practically all cases; when it has not, some local supplementary operation must be done.

In cases of volvulus of the dilated sigmoid, a common complication (it occurred



Figs. 26 to 30.—*26*, division of sigmoid. *27*, second row of sutures. Stitches applied to all coats of rectum and sigmoid. *28*, reduction of everted rectum. *29*, perineal stage of operation completed. Rubber drainage tube delivered out in the anococcygeal line. *30*, final aspect of the operation, in a sagittal section. Low extraperitoneal sigmoidorectal anastomosis. Rubber drainage tube in presacral space.

in about one-third of my patients), the operation is performed in three stages: (1) detorsion of the loop and transverse colostomy performed as an emergency operation; (2) rectosigmoidectomy, done two or three weeks later, and (3) closure of the colostomy. The performance of transverse colostomy at the first stage has two main advantages: (a) it promotes exclusion of the dilated sigmoid, which prevents or greatly reduces the danger of a new torsion, and (b) it obliges the patient to submit himself to the definitive operation. I noted that many patients consented only to detorsion of the loop, only to have recurrence of this complication. One patient of this series had previously been operated on 11 times for this purpose.

In cases of volvulus with gangrene of the sigmoid portion of the colon, emergency sigmoidectomy is the operation of choice. No attempt is made to reestablish intestinal continuity; the proximal loop is delivered out through a stab wound as a colostomy and the distal one closed down at the level of the peritoneal cul de sac. Resection, followed by rectocolic anastomosis, is performed later.

Postoperative Complications. — Postoperative complications occurred in a fair number of cases. Some were rare—wound

infection, pulmonary atelectasis, thrombophlebitis of the legs, peritonitis and obstruction of the small bowel; others, however, such as cystitic and partial disruption of the anastomosis, were comparatively common. Cystitis is supposed to result from a neurogenic bladder, which is frequently observed after these operations. With proper handling, no serious consequences resulted from this complication. Partial disruption of the anastomosis was the commonest postoperative complication. It developed usually as a sinus, which healed spontaneously in practically all cases. On some patients, however, posterior fistulectomy had to be performed.

Mortality.—There were 9 deaths in this series (4.5 per cent), 4 being associated with the abdominal and 5 with the abdominoperineal resection. Six patients died of peritonitis; 1 of postransfusional nephron syndrome; 1 of a complication of Chagasic myocarditis, and 1 of bilateral bronchopneumonia. It should be mentioned that after a better acquaintance with the operation and the routine performance of proximal colostomy, the mortality rate decreased considerably. Of the 130 patients last operated upon, only 4 died—2 of the deaths being due respectively to the nephron syndrome, and cardiac complications, and obviously not attributable to the operation itself.

Results.—The final results with both methods of rectosigmoidectomy were considered satisfactory. Follow-up studies were made of almost all patients subjected to abdominal rectosigmoidectomy, in some instances for eight years or longer. All "felt cured" except 2; endoscopic and roentgen studies revealed, in both cases, stenosis at the level of the anastomosis and proximal dilatation of the colon. In 1 case, notwithstanding the fact that the patient had daily bowel movements, roentgen studies showed recurrence of megacolon. Follow-up studies of patients subjected to abdominoperineal rectosigmoidectomy showed favorable results in all but 4 of the cases followed. Three patients had stenosis at the anastomotic line, and 1 had recurrence of the disease, in spite of the absence of any obstacle at the anastomotic level.

Anal continence remained normal in all patients subjected to abdominal rectosigmoidectomy. In those who underwent abdominoperineal rectosigmoidectomy it was frequently disturbed in the immediate postoperative course, the patients having had from five to fifteen daily bowel movements. This trouble disappeared, as a rule, in some weeks. In a few cases, however, slight incontinence for gases and liquid feces persisted for years. In 1 patient total incontinence was observed.

Sexual potency was studied in young male patients who had considered themselves sexually normal before the operation. There was a striking difference in sexual behavior after the two methods of rectosigmoidectomy aforementioned. No sexual disturbance was noted in patients subjected to abdominal restosigmoidectomy. In patients subjected to abdominoperineal rectosigmoidectomy, on the contrary, serious sexual troubles were observed. Six patients, aged respectively 20, 24, 26, 30, 32 and 38, complained of "coeundi" impotence. They were, of course, greatly worried about this new condition.

The exact cause of this grave disturbance is not yet well known. It probably results from lesion of the erector nerves in dissection of the lowest segment of the rectum, where these nerves have intimate connection with the rectal wall. Dissection of the rectum is carried down to the level of the anal elevator muscles in abdominoperineal rectosigmoidectomy, and at a more proximal level in abdominal rectosigmoidectomy. This probably explains the difference in sexual behavior observed after resection by these two methods.

Sexual complication was also observed

by Hallenbeck and Waugh[6] in a young man 27 years of age. These authors pointed out that male children subjected to abdominoperineal rectosigmoidectomy may feel sexually impotent when they reach adult life. This is also the opinion of State,[7] who imputes this disturbance to lesions of the erector nerves incurred in dissection of the rectum. Other experienced authors (Swenson and others;[8] Hiatt;[9] Bodian and others,[10] and Ehrenpreis[11]) do not refer to this complication. In a recent thesis, presented to the Faculdade de Medicina de São Paulo, I pointed out this problem.[12]

As one can see, it is a problem of major importance. My experience does not justify the conclusion that this operation leads commonly to this complication. The verification of sexual impotence, however, in the 6 young patients who had had normal sexual activity before they underwent abdominoperineal rectosigmoidectomy, strongly suggests that this operative method may result in this grave misfortune. The problem is a serious one and obviously demands careful investigation.

I may conclude, in retrospect, that rectosigmoidectomy, abdominal or abdominoperineal, deserves to be considered the present operation of choice for the treatment of megacolon, but that in establishing the indications for the latter operation it is necessary to consider the age of every male patient, owing to the possibility of its interference with sexual potency.

SUMMARY

The author refers to the two pathogenic bases under which rectosigmoidectomy was performed for the treatment of acquired megacolon, that of achalasia of the pelvirectal sphincter and that of dyskinesia of the distal portion of the intestine. He points out that the latter one is a better explanation for the disease.

The technic employed by the author in abdominal and abdominoperineal rectosigmoidectomy is presented. References are made to the tactics at present followed in complicated and uncomplicated cases and to the main postoperative complications and the mortality rate. The value of proximal colostomy is pointed out.

The results obtained in 200 operative cases are described. Special references are made to disturbances of anal continence and sexual potency.

The final conclusion is that rectosigmoidectomy, abdominal or abdominoperineal, deserves to be considered the operation of choice for the treatment of megacolon. In determining the indications for the latter, however, it is necessary to consider the age of the male patients, because of the possibility that sexual impotence will result—as occurred in some young patients in this series.

RÉSUMÉ

L'auteur se réfère aux deux bases pathogéniques sur lesquelles a été pratiquée la rectosigmoidectomie pour le traitement du mégacolon acquis, soit l'achalasie du sphincter pelvirectal et la dyskinésie de la portion distale de l'intestin. Il souligne que la dernière explique mieux cette affection.

L'auteur décrit sa technique de la rectosigmoidectomie abdominale et abdominopérinéale. Il cite les méthodes actuelles dans les cas simples et compliqués, et passe en revue les principales complications postopératoires en mentionnant les taux de mortalité. Il insiste sur la valeur de la colostomie proximale.

Les résultats obtenus dans 200 cas opérés sont exposés. L'auteur s'étend sur les troubles de la continence anale et du potentiel sexuel.

Il conclut que la rectosigmoidectomie abdominale ou abdominopérinéale mérite d'être considérée comme l'opération de choix dans le traitement du mégacolon. Quant à ses indications il est indispensable

de prendre en considération l'âge des patients, mâles en raison de la possibilité d'une impotence sexuelle ultérieure, comme ce fut le cas chez quelques-uns de ses malades.

SUMARIO

O autor se refere às duas bases patogênicas sob as quais a rectosigmoidectomia foi realizada para o tratamento de megacolon adquirido, a da acalásia do esfincter pelviretal e a da disquinesia do porção distal do intestino. Chama a atenção para o fato de que a última é a melhor explicação para a moléstia.

A técnica empregada pelo autor na retosigmoidectomia abdominal e abdominoperineal é apresentada. Faz referências à tática que atualmente usa nos casos complicados e não complicados e às complicações pós-operatórias e média de mortalidade. Salienta o valor da colostomia proximal.

Descreve os resultados obtidos em 200 casos operatórios. Faz especial referências aos distúrbios da continência anal e potência sexual.

A conclusão final é a de que a retosigmoidectomia, abdominal ou abdominoperineal, merece ser considerada a operação de escolha para o tratamento do megacolon. Ao determinar as indicações para o último, entretanto, é necessário considerar a idade dos pacientes masculinos, por causa da possibilidade de que resulte a impotência sexual—conforme ocorreu em alguns pacientes jovens desta série.

RIASSUNTO

L'autore si richiama alle due teorie patogenetiche del megacolon acquisito: quella dell'acalasia dello sfintere pelviretale e quella della discinesia della porzione distale dell'intestino. Quest'ultima sembra più adatta a spiegare la malattia.

La tecnica usata dall'autore nella rettosigmoidectomia addominale e addominoperineale viene decritta, con particolari relativi al trattamento delle complicazioni intra e postoperatorie. E' importante la colostomia prossimale.

Vengono riferiti i risultati ottenuti nella cura di 200 malati, con particolare riguardo ai disturbi della continenza ahale e della funzione sessuale.

La conclusione è che la rettosigmoidectomia addominale o addominoperineale è l'intervento di elezione nella cura del megacolon. Nello stabilire le indicazioni, tuttavia, è necessario tener conto dell'età del paziente, perchè può derivarne una impotenza sessuale.

ZUSAMMENFASSUNG

Der Verfasser berichtet über zwei pathogenetische Faktoren, die als Grundlage zur Ausführung der Resektion des Sigmoideums und des Mastdarms in der Behandlung des erworbenen Megakolons dienten, nämlich den Spasmus des Beckensphinkters des Mastdarms und die Dyskinesie des Endabschnittes des Darmes. Er hebt hervor, dass die letztere eine bessere Erklärung der Erkrankung abgibt.

Die vom Verfasser zur Ausführung der abdominalen und abdominoperinealen Resektion des Sigmoideums und des Mastdarms angewandte Technik wird beschrieben. Auf die in komplizierten und in unkomplizierten Fällen zurzeit angewandten Verfahren, auf die wesentlichen postoperativen Komplikationen und auf die Sterblichkeitsquote wird hingewiesen. Der Wert der proximalen Kolostomie wird hervorgehoben.

Die an 200 operierten Fällen erzielten Resultate werden beschrieben unter besonderem Hinweis auf Störungen der Kontinenz des Afters und Störungen der sexuellen Potenz.

Die Schlussfolgerung ist, dass es berechtigt ist, die abdominale oder abdominoperineale Resektion des Sigmoideums und des Mastdarms als Operation der Wahl

für die Behandlung des Megakolons anzusehen. Bei Abwägung der Indikation ist es allerdings notwendig, das Alter männlicher Patienten in Betracht zu ziehen, weil, wie sich bei einigen jungen Kranken in der Serie des Verfassers herausgestellt hat, die Möglichkeit sexueller Impotenz als Folge der Operation besteht.

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Life will give you what you ask of her if only you ask long enough and plainly enough.

—Nesbit

In our own times, as well as in history, we may find lessons but never models.

—Napoleon

A Procaine Sclerosing Solution for the Treatment of Internal Hemorrhoids

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AND

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THE treatment of internal hemorrhoids is certainly a daily occurrence to the proctologist and is frequently encountered by those who do not limit themselves to proctology.

Not all hemorrhoids are amenable to injection therapy, since combined internal-external hemorrhoids, especially those of the prolapsing type, are preferably dealt with by hemorrhoidectomy. Statistical data as to the proportion of hemorrhoids treated by the sclerosing method vary widely, but the consensus is that from 25 to 50 per cent of hemorrhoids are amenable to injection treatment.[1] Those that are not pedunculated and present an adequate base are ideal for sclerosing therapy. On the other hand, some patients with prolapsing internal hemorrhoids are not good surgical risks, and sclerosing therapy serves as a palliative measure. A specific group of patients, therefore, will require treatment by injection. It is well to note that the end result is not always as desired with the large prolapsing type of internal hemorrhoids,[2] and therefore one should decide between the surgical or the sclerosing approach as best fits the pathologic picture in the individual case.

Postinjection Pain. — Discomfort associated with the treatment of anorectal conditions frequently deters the average patient from presenting himself to a physician for diagnosis and treatment. Therefore, much proctologic disease goes undiagnosed, and the opportunity to deal with rectal disease in its early stages is lost. Consequently, we were prompted to do this comparative study with a sclerosing solution, with and without procaine, as an approach to the alleviation of one phase of discomfort in the proctologic field.

The sclerosing solution of choice has been quinine and urea hydrochloride, since its sclerosing property is good and it is simple to handle, whereas phenol in oil is slow to inject and does not lend itself to a sufficient degree of asepsis. In addition, a painful oleoma frequently occurs as a result.[3]

With a 5 per cent quinine and urea hydrochloride solution we have observed that 55 per cent of a series of 200 patients complained of some degree of discomfort following injection. This varied from mild proctalgia to a severe sensation of intrarectal pressure with tenesmus, resulting in temporary incapacity. The onset of discomfort was usually fifteen to thirty minutes after the injection, and the duration varied from twenty minutes to two hours. Postinjection pain had been considered relatively infrequent, but systematic inquiry yielded the foregoing rather high incidence. Many patients made no complaint of their pain unless specifically questioned. Those with severe postinjection pain, however, invariably complained of the effect of the treatment.

Pain was overcome in part by the ad-

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ministration of ½ gr. of codeine and 10 gr. of acetylsalicylic acid (aspirin). In many cases, however, the postinjection pain occurred before the analgesic effect could intervene. Therefore, a 2 per cent solution of procaine in a 5 per cent solution of quinine and urea hydrochloride was obtained* for comparative analysis.

Contraindications.—1. External hemorrhoids should never be treated by injection, nor should the needle be inserted distal to the anorectal line.

2. Idiosyncracy to quinine interdicts its use.

3. Inflammatory, infected or thrombosed internal hemorrhoids should never be treated by injection.

4. Complicating surgical conditions of the anus or rectum.

Technic.—The position of the patient is a matter of individual preference, but our routine is to have him assume the right Sims position. Through a Barr-Shuford or any desired proctoscope, the hemorrhoid to be injected is exposed and cleansed with an aqueous antiseptic. The injection is made into the hemorrhoidal mass, within the submucosal area. An average of 1 to 1.5 cc. of solution is injected slowly. It is not necessary to inject into the muscularis unless prolapse is encountered, and then it should be done with considerable caution. The overlying mucosa should not be distended beyond the stage at which it begins to blanch, since pressure necrosis, with sloughing, invariably results. It is difficult and undesirable to inject into the lumen of a vein, owing to the comparatively small caliber of the venous plexus, but if blood can be aspirated the needle should be withdrawn and reinserted. All injections should be made above the anorectal line, and, since the rectal mucosa is innervated by an autonomic supply, no pain should be caused by the insertion of the needle. If pain does occur, it usually indicates erroneous insertion of the needle. One or two hemorrhoids, depending upon the size, should be treated at intervals of about one week. If induration persists in a previously injected area, it is preferable to defer reinjection at that site.

Basis for Use of Procaine.—The obvious intention of the incorporation of procaine into the sclerosing solution was to control postinjection discomfort. The literature defines two other actions of procaine, however, which appeared applicable to its injection with a sclerosing solution; first, the effect of procaine in delaying absorption of penicillin, and second, its antihistamine-like effect.[4]

The parallel in sclerosing therapy was drawn because of the occasional side reactions of quinine manifested by vertigo, giddiness and nausea, and also because the degree of fibrosis might be enhanced by a staying action of a substance like procaine. The delaying action of procaine on the absorption of penicillin has been well established,[5] and it can therefore be presumed that the absorption of quinine and urea hydrochloride may likewise be delayed by the action of procaine. This serves to enhance the sclerosing property by allowing longer contact with the hemorrhoidal substance, and lessens the possibility of systemic reactions due to rapid absorption of quinine. Equally important is the postulate that procaine has a desensitizing action on quinine, since a clue may be found in the close chemical relation between procaine and the antihistamine drugs.[6]

Results.—Eight hundred patients were given injections of the procaine, quinine and urea hydrochloride solution, with a marked degree of amelioration of postinjection pain. The incidence of any degree of discomfort following injection was reduced to 32 per cent of those treated, as compared with 55 per cent of those treated without procaine. It was further noted

*Material for this study was supplied by Upjohn Company.

that the onset of pain was delayed by ten to thirty minutes longer than in the group not given the procaine mixture, so that frequently pain was not felt for one-half to one hour after treatment. Of the 32 per cent who had pain, it was mild and tolerable in 69 per cent, while in 31 per cent it was severe and incapacitating. Pain in the latter group was invariably mild during the limits of activity of the anesthetic agent, becoming severe only subsequently.

Systemic reactions to quinine were decidedly fewer in the group given quinine plus procaine. There were 28 patients who showed sensitivity to the quinine solution. The reduction of reactions to quinine might be predicated upon the delaying action of procaine on absorption and the postulate of the chemical relation of procaine to antihistamine drugs.

The induration following administration of procaine and quinine was generally more profound than that previously observed with quinine alone.

Incidence of Postinjection Pain

	% of Total Treated	*% Severe*	*% Mild*	*Average Duration*
Sclerosing solution without procaine	55%	52%	48%	20 min. to 2 hours
Sclerosing solution with procaine	32%	31%	69%	15 min. to 1 hour

COMMENT

Pain following sclerosing treatment for internal hemorrhoids has been a disturbing element in the nonoperative approach to this disorder. Although the period of discomfort is relatively short, the pain is none the less distressing and complicates an otherwise simple office procedure. The addition of 2 per cent procaine to the sclerosing solution not only reduced the incidence and severity of pain but delayed its onset, thereby shortening the total period of discomfort.

The routine use of 2 per cent procaine in sclerosing solutions used in injection therapy of internal hemorrhoids is advantageous, and is an important approach to the treatment of patients with this proctologic disease. The utmost care and consideration should be given to a locus of high sensitivity in examination or instrumentation of rectal patients.

SUMMARY

1. Analysis of 800 patients given 5 per cent quinine and urea hydrochloride solution as a sclerosing agent for internal hemorrhoids was made. The incidence of postinjection pain in varying degrees was 55 per cent.

2. The addition of 2 per cent procaine hydrochloride to the sclerosing solution reduced the incidence of pain to 32 per cent of 800 patients so treated. Of this group, 69 per cent had mild and tolerable discomfort, while 31 per cent had severe proctalgia. The duration of pain was shortened.

3. The lesser incidence of sensitivity reactions to quinine is thought to be based on the delaying action of procaine on the absorption of quinine and a questionable local antihistamine-like effect of procaine.

RIASSUNTO

1. Sono stati studiati 800 pazienti nei quali erano state praticate iniezioni sclerosanti di chinino e urea nelle emorroidi. Il dolore postoperatorio, di grado variabile, fu presente nel 55% dei casi.

2. L'aggiunta di procaina al 2% ridusse al 2% la frequenza del dolore postoperatorio in altri 800 pazienti. In questo gruppo il 69% ebbe un modesto e tollerabile fastidio, mentre il 31% ebbe un dolore notevole. Anche la durata del dolore fu abbreviata.

3. La diminuzione della reazione dolorosa alla chinina probabilmente è dovuta all'azione della procaina che ritarda l'assorbimento della chinina e che ha una discutibile azione antiistaminica locale.

RÉSUMÉ

1. Des analyses ont été pratiquées chez 800 malades ayant reçu 5% de quinine et de solution de chlorhydrate d'urée comme agent sclérosant pour des hémorrhoïdes internes. La fréquence des douleurs à des degrés divers après l'injection a été de 55%.

2. L'addition à la solution sclérosante de 2% de chlorhydrate de procaïne a réduit l'incidence des douleurs à 32% sur 800 cas traités. 69% des cas présentaient une gêne tolérable, alors que 31% souffraient d'une proctalgie grave. La durée de la douleur était écourtée.

3. La moindre fréquence des réactions douloureuses à la quinine provient sans doute de l'action diluante de la procaïne et de la possibilité d'un effet antihistaminique local de la procaïne.

SUMARIO

1. Foi feita uma análise de 800 pacientes a quem se deram quinino e solução de hidrocloreto de ureia como agente esclerosante para hemorroidas internas. A incidência da dôr após a injeção em vários graus foi de 55 por cento.

2. O acréscimo de 2 por cento de hidrocloreto de procaina à solução esclerosante reduziu a dor para 32 por cento dos 800 pacientes assim tratados. Dêste grupo, 69 por cento tiveram ligeiro e tolerável mal estar, enquanto 31 por cento tiveram séria proctalgia. A duração da dor foi diminuida.

3. Acredita-se que a menor incidência de reações de sensibilidade ao quinino está baseada na ação retardada da procaina na a sorção do quinino e em um efeito antida procaina.

ZUSAMMENFASSUNG

1. Es liegt eine Studie an einem Krankenmateriel von 800 Patienten vor, die wegen innerer Hämorrhoiden mit sklerosierenden Einspritzungen einer 5prozentigen Lösung von Chinin und Harnstoffhydrochlorid behandelt wurden. Die Häufigkeit des Auftretens von Schmerzen verschiedenen Grades nach der Einspritzung betrug 55%.

2. Der Zustaz von 2% Novocain zu der sklerosierenden Lösung setzte die Häufigkeit des Schmerzes bei 800 so behandelten Kranken auf 32% herab. In dieser Gruppe hatten 69% nur leichte und erträgliche Beschwerden, 31% aber heftige Mastdarmschmerzen. Die Dauer des Schmerzes war verkürzt.

3. Die geringere Häufigkeit des Auftretens von Überempfindlichkeitsreaktionen gegenüber dem Chinin glaubt man auf eine durch das Novocain hervorgerufene Verlangsamung der Absorption des Chinins und vielleicht auch auf einen etwas fraglichen örtlichen Antihistamineffekt des Novocains zurückführen zu können.

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Carcinoma of the Esophagus

Review of Two Hundred and Forty Cases

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BETWEEN March 1950 and April 1955 I have observed and treated carcinoma of the esophagus in 240 cases. On the basis of this experience, I am able to record the data here presented.

Sex Incidence.—In this respect my observations are similar to those of other writers. Thirty-six of my patients (15 per cent) were women, and 204 (85 per cent) were men.

Age Incidence.—Almost all of my patients were between 50 and 70 years of age. None was under 20 or over 85 (Table 1).

Tumor Site.—Since my service is concerned especially with thoracic surgery, the most frequent site of esophageal carcinoma was the thoracic segment (195 cases, or 81.25 per cent). In 30 cases (12.5 per cent) the tumor occurred in the abdominal segment, and in 15 (6.25 per cent) it occurred in the cervical segment (Table 2).

In the majority of cases carcinoma of the thoracic segment of the esophagus was situated in the lowest portion thereof (135 cases, or 56.25 per cent). There were 23 lesions of the supra-aortic portion (18 per cent) and 37 of the para-aortic portion (11.79 per cent).

Of the tumors of the lower portion of the thoracic esophageal segment, 60 (30.6 per cent) occurred in the subaortic area and 75 (36.4 per cent) in the subdiaphragmatic region.

Operability (Table 3).—The organization of this hospital enables the staff to see patients in the early stages of disease. As a result, I have been able to establish two early syndromes. One of them is characterized by daily and rhythmic pain associated with eating, which may or may not be accompanied by a burning sensa-

TABLE 1.—*Age and Sex Incidence*

Age	*No. of Patients*	*Male*	*Female*
30-40	14 (5.8%)	8 (57.1%)	6 (42.8%)
40-50	32 (13.3%)	27 (84.3%)	5 (15.6%)
50-60	115 (47.9%)	100 (86.9%)	15 (13%)
60-70	69 (28.7%)	61 (88.4%)	8 (11.5%)
70-80	9 (3.75%)	7 (77.7%)	2 (22.2%)
80-90	1 (0.41%)	1 (100%)	
Total	240	204 (85%)	36 (15%)

TABLE 2.—*Incidence According to Site of Tumor*

Esophageal Location	*No. of Cases*	*% of Cases*
Cervical segment	15	6.25
Abdominal segment	30	12.5
Thoracic segment	195	81.25
Supra-aortic	23	11.79
Para-aortic	37	18.9
Subaortic	60	30.6
Supradiaphragmatic	75	36.4

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TABLE 3.—*Incidence According to Operability*

Clinically operable tumors	200 (83.3%)
Clinically inoperable tumors	40 (16.6%)
Cervical segment	2 (5%)
Supra-aortic segment	8 (20%)
Para-aortic segment	6 (15%)
Subaortic segment	6 (15%)
Supradiaphragmatic segment	8 (20%)
Abdominal segment	10 (25%)

TABLE 4.—*Incidence of Operation and Nonoperation in Cases of Operable Tumor*

Clinically operable tumors	200 (83.3%)
Operation refused	6 (3%)
Operation performed	194 (97%)

TABLE 5.—*Correlation of Tumor Site and Operative Status*

Site of Tumor	*No. of Cases*	*Inoperable*	*Operation Refused*	*Operation Performed*
Cervical	15	2	2	11
Supra-aortic	23	8	2	13
Para-aortic	37	6		31
Subaortic	60	6		54
Supradiaphragmatic	75	8	1	66
Abdominal	30	10	1	19
Total	240	40	6	194

tion in the esophagus and stomach. The other picture is characterized by intermittent dysphagia.

In cases of the first type, after eliminating the possibility of duodenal ulcer or disease of the biliary tract, I direct my attention to the esophagus. Roentgen and esophagoscopic examinations are done as soon and as often as is necessary to identify the pathologic change. When intermittent dysphagia is present, I proceed in the same manner. If an anatomic lesion is demonstrated, I perform a biopsy; if no lesion is demonstrated, I repeat the examination as many times as may be necessary. In this way the patients are brought into condition for operation with a high probability of success.

In a total series of more than 240 cases, 40 patients were considered clinically operable; 6 refused the operation, and 194 were operated on (Table 4). Of these 194 patients, 21 had nonresectable tumors as revealed by thoracotomy. The tumors of 162 were resected. The distribution of the nonresectable growths, according to localization, is indicated in Table 5.

Type of Operation.—As is shown in Table 6, the tumors in 164 cases were located in the thoracic cavity and in 19 instances the abdominal cavity was the site. All of them, however, were approached by thoracotomy. In 11 cases the neoplasms were located in the cervical portion of the esophagus. Nine of the 11 patients with

TABLE 6.—*Types of Operation Performed*

Operation	*No. of Cases*	*% of Cases*
Cervical	11	
Wookey's	9	
Less radical procedure	2	
Thoracotomy	183	
Resection	162	88.52
With cervical esophagogastrostomy	19	
With thoracic esophagogastrostomy	134	
High	23	
Middle	41	
Low	70	
With thoracic esophagojejunostomy	9	
Operation without resection	21	11.42
Supra-aortic	2	
Para-aortic	4	
Subaortic	9	
Supradiaphragmatic	6	

cervical tumors were subjected to the Wookey operation; the remaining 2 underwent less radical resection. The remaining 183 (with thoracic and abdominal tumors) were approached by thoracotomy, but in 21 instances the tumors proved nonresectable.

In 162 cases it was possible to perform esophagogastrostomy or esophagojejunostomy.

For tumors situated at a high level, anastomosis was performed in the neck. In 134 cases I was able to create the anastomosis in the thoracic cavity (23 over the aortic arch, 41 under the arch and 70 over the diaphragmatic muscle).

In 9 cases the extent of the lesion made it necessary to perform esophagojejunostomy instead of esophagogastrostomy. In cases of nonresectable tumor, in which a palliative procedure was indicated, I performed esophagogastrostomy (8 cases) or esophagojejunostomy (5 cases) without resection.

When it is possible to do so in a case of nonresectable tumor, I prefer to perform esophagogastrostomy without resection, but when the patient's condition requires caution I am content to perform anastomosis only.

End Results.—I have performed 194 operations for carcinoma of the esophagus. In 11 cases the tumor was located in the cervical segment; 2 of the patients died in the early postoperative period, and 9 are living at the time of writing. This represents a survival rate of 81.81 per cent.

The results in the 183 cases of thoracic tumor are as follows: Of the patients whose tumors were resected, 162, or 69.75 per cent, are living at the time of writing; 49, or 30.24 per cent, are dead. There were 21 patients with nonresectable tumors; of these, 2 have survived and the remaining 19 are dead. For the total series of 194 cases, the final results (Table 7) is survival of 124 patients (62.7 per cent) and death of 49 (38.5 per cent).

SUMMARY

Between March 1950 and April 1955 the author observed 240 cases of carcinoma of the esophagus, in 40 of which the

TABLE 7.—*End Results*

Operation	*No. of Cases*	*Death After Operation*					*Survival*
		Immediate	*2-3 Mo.*	*4-8 Mo.*	*8-12 Mo.*	*Longer*	
Thoracotomy	183						
Resection	162						
With cervical esophagogastrostomy	19				3	2	14
Intrathoracic esophagogastrostomy							
High	23	4			1	2	16
Middle	41	2		2	4	2	28
Low	70	1	3	4	9	4	50
Intrathoracic esophagojejunostomy	9	1			2	1	5
Palliative procedure (without resection)	21		4	6	8	1	2
Cervical operation	11						9
Wookey's	9	2					
Others	2	1					
Total	194			70 (38.25%)			124 (62.7%)

patients were discharged without operation and 6 refused operation. In 194 cases operation was performed, but in 21 resection was impossible because of the extent of the lesion and its metastases.

In 173 cases resection was possible, and various technics were used. The rate of survival was 62.7 per cent (124 cases) and the mortality rate 38.25 per cent, death having occurred in 70 cases. Nine patients died within forty-eight hours after the operation; 12 between four and eight months; 27 between eight and twelve months, and 12 after longer periods of survival.

The statistical picture will be improved when more patients accept operative treatment at an earlier stage of the disease and when surgeons make a point of operating as soon as possible.

The technical aspect of the author's therapy is not touched upon, since he intends to make it the subject of another work.

CONCLUSOES

De março de 1950 a abril de 1955 o autor observou 240 casos de cancer do esôfago, em 40 dos quais os pacientes tiveram alto sem operação. Seis recusaram a operação. Em 194 casos a operação foi feita, mas em 21 foi impossível fazer a ressecção, por causa da extensão da lesão e suas metástases.

Em 173 casos a ressecção foi possível, e várias técnicas foram usadas. A média de sobrevida foi de 62.7% (124 casos) e a média de mortalidade de 38.25%, tendo a morte ocorrido em 70 casos.

Nove pacientes morreram dentro das primeiras 48 horas; 10 entre 2 e 4 meses; 12 entre 4 e 8 meses, 27 entre 8 e 12 meses e 12 depois de períodos mais longos.

O quadro estatístico tornar-se-á melhor quando os pacientes aceitarem a operação em um estágio primário, e quando o cirurgião fizer a operação o mais cedo possivel.

O quadro ténico não é salientado, pois será objeto de outro trabalho do autor.

CONCLUSIONS

De mars 1950 à avril 1955 l'auteur a traité 240 cas de cancer de l'oesophage; 40 malades ont quitté la clinique sans opération, 6 ont refusé toute intervention. 194 cas ont été opérés; dans 21 cas la résection a été impossible en raison de l'extension de la lésion et des métastases.

La résection a été pratiquée dans 173 cas au moyen de techniques diverses. Taux de survie: 62,7% (124 cas); taux de mortalité: 38,25% (70 décès).

9 malades sont décédés au cours des premières 24 heures; 10 entre 2 et 4 mois, 12 entre 4 et 8 mois, 27 entre 8 et 12 mois, et 12 après des périodes plus longues.

Les statistiques seront meilleures quand les malades accepteront l'opération à un stade précoce.

Les techniques opératoires feront l'objet d'un travail ultérieur.

CONCLUSIONI

Dal marzo del 1950 all'aprile del 1955 l'autore ha osservato 240 casi di cancro dell'esofago; 40 pazienti furono dimessi senza intervento; 6 rifiutarono l'operazione; 194 furono operati ma in 21 fu impossibile eseguire la resezione per la diffusione delle lesioni.

In 173 casi fu possibile l'intervento radicale, eseguito con tecniche varie. La percentuale della sopravvivenze fu del 62,7% (124 casi) e la mortalità operatoria del 38,25% (70 casi).

Novo pazienti morirono nelle prime 48 ore; 10 dopo 2-4 mesi, 12 dopo 4-8 mesi; 27 dopo 8-12 mesi e 12 dopo un periodo più lungo.

La statistica potrebbe essere migliore se i pazienti acconsentissero a farsi operare in stadi più precoci e se il chirurgo potesse operare il più presto possibile.

Non viene trattata la tecnica, poichè su questo argomento verrà scritto un altro lavoro.

SCHLUSSFOLGERUNGEN

In der Zeit von März 1950 bis April 1955 sah der Verfasser 240 Fälle von Speiseröhrenkrebs. Vierzig dieser Kranken wurden als inoperabel entlassen, sechs lehnten die Operation ab. Unter den 194 operierten Fällen war eine Resektion bei 21 Kranken wegen der Ausdehnung und Metastasierung der Erkrankung unmöglich.

In 173 Fällen konnte eine Resektion ausgeführt werden, wobei verschiedene Techniken zur Anwendung kamen. 63.9 Prozent aller operierten Kranken überlebten den Eingriff (124 Fälle), und die Sterblichkeitsquote betrug mit 70 Todesfällen 36.1 Prozent.

Neun Kranke starben innerhalb von 48 Stunden nach der Operation, zehn innerhalb von zwei bis vier Monaten, zwölf swischen vier und acht Monaten, 27 zwischen acht und zwölf Monaten und zwölf nach längeren Zeitabschnitten.

Eine Besserung der Statistik lässt sich erwarten, wenn die Kranken sich in einem frühen Stadium zur Operation bereit erklären und der Chirurg den Eingriff so bald wie möglich ausführt.

Auf die technische Seite des Problems wird nicht besonders eingegangen, weil dies in einer weiteren Arbeit des Verfassers zur Sprache kommt.

It is impossible to cure all patients; that would be an achievement surpassing in difficulty even the forecasting of future developments. But seeing that men die before the physician is able to bring his skill to grapple with the case—some owing to the violence of the disease die before they have summoned the doctor, some as soon as he arrives; some live one day, others a little longer—in view of this, an understanding of such diseases is needed. One must know to what extent they exceed the strength of the body and one must have a thorough acquaintance with their future course. In this way one may become a good physician and justly win high fame. In the case of patients who were going to survive, he would be able to safeguard them the better from complications by having a longer time to take precautions. By realizing and announcing beforehand which patients were going to die, he would absolve himself from any blame.

—*Hippocrates*

Editorial

Medical Illustration

Its History and Present Day Practice

YEARS ago I considered medical illustrations simply a little adjunct—a useful device of some value in the teaching of anatomy, surgery, pathology and other branches of medical practice. But, as the years rolled by, I could not help but be impressed with the great interest of the medical profession in good illustrations. As I delved a little into the history of medical illustration I came to realize that pictures have played a vital rôle not only in teaching but in the actual development of surgery to its present high levels, and there is good reason for this.

To illustrate: To make diagrams and pictures of a subject one is studying is a natural instinct of the human intellect when it attempts to comprehend anything. In fact, it might almost be said that comprehension consists of just that—the ability to visualize the subject. We say that we understand something; we mean that we can diagram it mentally. We say that we understand the heartbeat; we mean that we have a mental image of the heart in systole and diastole—of the synchronized opening and closing of the valves. We can visualize the conduction system, etc. We say that we understand acute cholecystitis; we mean that we have a mental image of an acutely inflamed gallbladder. We say that we understand the kneejoint; we mean that we can visualize the semilunar cartilages, the heads of the bones, the cruciate ligaments and the quadriceps muscles.

Illustration simply consists, then, of transferring this mental image or diagram from our minds to the paper or to any other medium. Indeed, the success of an illustration often depends on how accurately and effectively we transfer this image to the paper. This is not always simple, for often, in the course of making a drawing, the artist or the physician becomes infatuated with his own artistic creation and finds himself adding a little of this and a little of that to embellish the drawing until the essential point of the picture, the original image in the artist's mind, is all but lost.

Medical illustration may be said to have three main functions: First, it helps the student or physician who is studying a subject to clarify it in his own mind. As he "doodles" the thing out on paper, as he studies it, he is aided in forming a mental image of the subject. In this sense the hand cooperates with the brain. Second, it helps to transmit ideas to others, as in a lecture, a private conversation, a conference or a published article. Third, it serves to preserve ideas for posterity, e.g., in a book or other publication.

I should like to call particular attention to the last two, for it is by means of these two factors that the progress of surgery has been so greatly aided by illustrations.

Now I do not wish to detract from the glory of the great geniuses who have made such vital and far-reaching discoveries in medicine and surgery in the past few decades; who have, in fact, almost revolutionized medical and surgical practice. Nevertheless, these great discoveries represent the culmination of the efforts of many men adding piece by piece, bit by bit to knowledge, until the final great discovery is made that clinches the matter. Our modern surgical and medical edifice has been built block by block by men who have added their stones one at a time, in different eras and in different parts of the world. This cooperative enterprise has been made possible through the dissemination of ideas, through the accurate depiction of one man's thinking, the accurate transmission of this man's thoughts to another man in a different part of the world and at a different time. The written word has served to a great extent in accomplishing this, but, in my opinion, so far as surgery is concerned, illustrations have been even more vital. It is only through a drawing that one can really transmit the concept of a procedure to one who is not actually present.

Evidence that it is instinctive in man to make pictures or diagrams of his ideas is found in the fact that the earliest men did this; men of all races and at all times and in all places have resorted to illustrations of one sort or another in putting down their ideas. The cavemen cut into stone their ideas of what went on in the human body. The ancient Egyptians and Babylonians made crude medical illustrations. So did the American Indians. I have seen diagrams made by the American Indians in their inimitable primitive style, telling how an Indian ate some bad fish, got a fire in his belly and finally died. They actually drew a picture of a man with a fire in his belly, and they had some concept of anatomy, too, for they indicated the intestines and some of the viscera. It is interesting to note their concept of fire as related to the origin of our term *inflammation.*

Throughout the middle ages, little was done in the field of medical illustration. Steeped in mysticism as those times were, medicine sank to a very low ebb and medical illustration, together with all learning and all knowledge, sank with it. Even Galen, in the second century, though he contributed so much to medical knowledge, apparently did not attempt to illustrate his prodigious writings. If he did, there is certainly nothing left of his work in this field. I attribute this largely to the fact that in those days there were no means of printing or reproducing illustrations. Certain it is, however, that when knowledge and medical science blossomed forth anew at the coming of the Renaissance, so also did medical illustration burst into bloom.

I do not know to whom credit should be given for the flowering of medical illustration at this time but certainly it is closely related to the advent of the great genius who lived and worked in Florence and in parts of France at about the time Columbus discovered America. I refer, of course, to the great Leonardo da Vinci. If Leonardo was not the greatest genius of all time, he certainly was one of the most versatile and universal.

Leonardo's essential characteristic was a fervent search for unity in all knowledge and all accomplishment. He studied and made contributions in practically every field of human endeavor, in science and in art. He was a great astronomer, geologist, engineer, physicist, philosopher, inventor, architect and, of course, painter and sculptor. Dukes called on him to build their palaces and their fortifications, to make their statues and their monuments and to paint their ladies' portraits. He directed their pageants; he built their canals. He designed cannons and devised the first tanks, though he hated and condemned warfare. He was kind and gentle. Often

he would buy birds just to set them free. He studied their flight, and, if he had had motive power at his disposal, he certainly would have invented a practical airplane. He did develop a practical submarine. He studied the winds and the air currents. He believed and taught that the earth revolved around the sun. He anticipated Newton's law of gravitation. He knew that the sea had at one time covered Italy and that the folding of the earth's crust countless aeons ago had raised the mountains and plains above the sea level. I need scarcely touch on his painting, for everyone knows that he created two of the best known, best loved and most valuable paintings of all time—the "Mona Lisa" and the "Last Supper."

Leonardo's anatomic studies and illustrations are all the more remarkable when one realizes that he had no texts and practically no reference material of any kind. He had no *Gray's Anatomy,* no dissection manual to guide him. He had to create his own methods and technics. In his lifetime Leonardo made approximately thirty dissections. It is amazing to realize that this man obtained from these thirty dissections as sound a comprehension of the construction of the human body as he revealed. Anyone who has done much dissection knows how difficult it is, even with a manual at hand, to trace out any system; yet this man, struggling under the most difficult conditions and hampered by the superstitions that had been built up through many ages, accomplished things that have placed him among the immortals.

There were two great characteristics in Leonardo's work: In this field as in others, he believed in basing his studies on fact rather than on authority. He gave the world some excellent advice: If you find from your own experience that something is a fact, and if it contradicts what some authority has written, you must abandon the authority and base your reasoning on your own discovery of the truth.

He was much criticized for this; many so-called wise men said that his ideas of anatomy could not possibly be true, because some authority, some mysticus of the Middle Ages, had written down—out of his imaginings, doubtless—that things were quite different. But Leonardo cared little for the opinions of these people, and he expressed his opinion of them very pointedly: "I care no more for the wind that issues from their mouths than I do for that which issues from their hinder parts."

The second great characteristic of Leonardo's anatomic studies is that they prove him to have been a functional anatomist. In this sense he had really a modern outlook. He wanted to understand *why* the anatomic structure was as he found it. He sought constantly for the significance of anatomic facts. He has been called the founder of physiologic anatomy. For example, he made accurate and careful studies of the exact form and contour of the muscles; but, not satisfied with this, he went further and represented them schematically as cords or strings. In this way, he said, one could get a better understanding of muscular action and the direction of pull.

The significance of this remarkable physioanatomic approach in a man who lived five hundred years ago was forcibly brought home to me only recently. When I was in Europe, I visited some of the outstanding professors of anatomy. On two occasions, after being greeted with the proper ceremony into the *sanctum sanctorum* of more than one good professor, I was told: "Dr. Netter, we admire your pictures very much for their clarity and for their accuracy. In fact, we are quite surprised at the detail of the information you have included, but we do not understand why you mix up so much physiology and so much clinical medicine with your anatomy." Of course, I was floored by

this. I attempted to explain that this was precisely what I was trying to do—to give meaning and clinical significance to the morphologic facts I was depicting. This, however, they could not or would not understand. To them anatomy was a pure science and, like most things that are 100 per cent pure, also 100 per cent sterile. Theirs was the purely didactic approach. They awed their students simply by the force of memorized but useless facts. They were secure in their ivory towers; they knew all the facts, but they would not stoop to apply them.

For many years the science of anatomy suffered from this attitude. Some thirty or forty years ago anatomy was a dead subject. All that was or was to be known was already written down in the books. It simply remained to memorize the books. To find any fact one simply had to turn to a certain page in any standard textbook of anatomy. In the last few decades, however, there has been a new crop of anatomists who have returned to the physiologic and clinical approach. These men are again asking "Why?" and "What is the significance?" As a result, there has been a rebirth of interest in anatomy, and anatomy today is again a living science. Investigators are turning to it more and more as a source for explaining phenomena. For example, study of the spiral arteries of the endometrium has had much to do with developing the modern concepts of menstruation. Modern reparative surgery of the hand is based almost entirely on the functional aspect of anatomy. Even modern understanding of the function of the hypothalamus in regulating the activity of the pituitary and endocrine functions of the body has developed largely through the combined anatomophysiologic studies of the neurohumeral mechanism of the hypothalamic cells. Leonardo, with his inquiring mind, could not help being an anatomophysiologist.

Since Leonardo was an artist, many may have the impression that he was chiefly concerned with surface anatomy. In general, this was true of the other artist-anatomists of the time, including such men as Michelangelo, Raphael and Albrecht Durer. But Leonardo went much deeper. He studied the viscera, the nervous system, the circulatory system. He studied and drew the details of the larynx in order to gain an understanding of voice production. His drawings penetrated into comparative anatomy, depicting the physical structures of the lower animals in relation to their counterparts in man. He actually made injection preparations of the ventricles of the brain.

Leonardo's remarkable anatomic illustrations were not published in his lifetime. At that time, in fact, illustrated medical texts were nonexistent. Shortly thereafter, however, the idea of publishing anatomic plates began to take hold. Among the earliest to appear were those of Charles Estienne, a Paris physician who collaborated with a surgeon, Riviere. Estienne employed a number of artists to make drawings, but apparently he had difficulty in getting the idea across to these artists that the purpose of the drawing was to elucidate anatomic facts, not to create fanciful artistic monstrosities. At times the artists would get completely out of hand and run riot with the drawings. Often, in illustrating a single anatomic detail, the artist would draw in the entire human figure and then embellish it with a decorative background or a landscape until the essentials of the picture were all but lost. The drawings are generally rather crude but sometimes a little amusing; for example, in an illustration of the dura mater, the artist has drawn the entire figure in an active pose, with a calvarium removed and hanging on a nearby tree as though the subject had just taken it off and hung it there as he would his hat. To Estienne, however, must be given the

credit which is due a pioneer, for a pioneer he was.

We now come to the great Andreas Vesalius, who established a landmark in the history of medical illustration. He has been called the father of modern anatomy. His works were the forerunners of the modern anatomic atlases. Vesalius was born in Brussels in 1513 or 1514, into a family of physicians. He studied in France, traveled rather extensively, became court surgeon and finally took the professorship of anatomy at Padua. His life was devoted to revolutionizing the teaching of anatomy, and this he chose to do through the medium of published anatomic illustrations. He employed a number of artists to make drawings of his dissections, but the man who probably made most of the illustrations was John Stephen of Calcar, a brilliant pupil of the great painter Titian. It has been said that Titian himself made some of the drawings for Vesalius, but most historians do not credit this. Vesalius appears to have had considerable trouble with his artists, both because of temperamental difficulties and with the problem of getting them to depict the structures accurately. Often the artist and the anatomist berated each other heatedly. When one realizes, however, that no preservative or embalming fluid was used in the specimens of those days, one can scarcely blame the artists if they preferred painting Madonnas to using a stinking carcass as a model. Vesalius always managed to get Stephen of Calcar back to work, however, by offers of more money. It is amazing how the artistic temperament succumbs to the influence of this commodity.

In both anatomic accuracy and artistic quality the works of Vesalius were far in advance of anything done up to that time. The drawings are made with exquisite precision and power, and they reflect the high levels of art and learning of that time as well as the calibre of the artists who made them. Much of their charm is derived from the graceful pose of the figures and from the lovely bits of landscape and background with which the artists embellished them. These background bits of artistic fancy, however, are never so dominant as to interfere with the clarity of the illustrations. They may have served a useful purpose as well, for at that time, although it was considered proper to make anatomic studies for artistic purposes, the practice was somewhat frowned on when pursued in the name of medical science. Despite Vesalius' prodigious labors, he never lost his love of travel. He finally died in a shipwreck in 1564.

A contemporary of Vesalius, Giovani Canano, also began work on an atlas of anatomy at about the same time, but when he heard of Vesalius' superior achievement he gave up the project, completing only one small volume on the upper extremities.

Vesalius really started something. The idea of illustrated anatomic and medical texts took hold, and there followed a number of similar enterprises. Vesalius' pictures were reproduced from woodcuts, but soon thereafter many of the pictures were printed from copper or steel engravings. Some of the outstanding works were those of Eustachi, Varolio (on the brain), Casserio, Spigelius, Bartholinus, Santorini, L'Admiral and Scarpa. Many of these names are preserved to us today in our modern anatomic nomenclature; thus we have the eustachian tube, Santorini's duct, the Spigelian lobe of the liver, Bartholin's gland and Scarpa's fascia.

William Hunter, the celebrated English physician and obstetrician of the eighteenth century, founded with his own money an institution for the study of anatomy. He employed a number of artists to make drawings, most of which depicted the gravid uterus. John Hunter, his brother and a distinguished surgeon,

helped in this project, particularly with the anatomic studies.

The next great step forward in medical illustration came with the invention of lithography, about 1800. Up to this time all of the illustrations had been reproduced from woodcuts or from copper or steel engravings of one sort or another. This meant that the artist first had to make the drawing, after which an engraver copied it and actually engraved or carved it into wood, copper or steel. This was a tedious and expensive process. Sometimes much of the quality and accuracy of the original drawing was lost in the engraving, and fine gradations of tone or shading were difficult or impossible to reproduce.

Lithography is a process of printing based on the mutual repulsion of oil and water. In the original process the drawing was made on the stone with a grease crayon. The stone was then wet with water, but the water wet only the stone and not the greased area. An oily ink was then applied, and this in turn did not adhere to the wet stone but remained only on the crayon marks — the heavier the crayon the heavier the ink. The stone was then applied to paper, and a duplication of the drawing appeared. To reproduce colored illustrations, a separate drawing was made on a separate stone for each color, the drawing of course being carefully and accurately registered. Each stone was then printed in ink of a different color, one superimposed on the other. Through lithography a number of exquisitely illustrated anatomic, medical and surgical texts appeared in the nineteenth century. I cannot possibly enumerate them all, but will mention a few. A beautiful and elaborate series of anatomic plates was published by Jones Quain about 1842. Another outstanding example was the work on surgical anatomy of Joseph Maclise, published in 1851. The French seemed to have developed lithography to its highest point of artistry, and the *Treatise on Fractures* by Anger and Velpeau, published in 1865, was an outstanding example. This beautiful volume, which contains one hundred lithographed plates in full color, is reproduced with exquisite fidelity and realism.

It is obvious, then, that the development of medical illustration went hand in hand with improvements in the reproduction process. The final great advances in pictorial reproduction came with the invention of photoengraving in 1868, the halftone screen in 1880 and finally the four-color printing process in 1893. These made it possible to reproduce pictures efficiently, accurately and economically by photomechanical means. It made possible the reproduction of practically any type of drawing in all gradations of tone and even in color, although color printing even today is costly.

In 1894 there came to this country from Germany an artist named Max Brodel. He was brought here largely through the influence of Drs. Kelly and Cullen of Johns Hopkins Medical School, and he voluminously illustrated many of Dr. Kelly's writings and also those of other famous Johns Hopkins physicians. Brodel did much to advance the standards of medical illustration in the United States, and a school for medical illustration was founded at Hopkins under his direction. He developed what is known as the scratch board technic. In this technic a special clay-coated paper is used; it is known as Ross board. The drawing is made with black chalk dust applied with brushes and then blended to the desired shading. The highlights are then scratched out with a sharp instrument, which gives a very luminous effect to the illustration.

Max Brodel and a number of his students made many beautiful and excellent drawings with this technic. Unfortunately, however, it became somewhat of a fetish, and some artists who came later seemed to have got the notion that making

a good medical illustration depended not on depicting the subject correctly but simply on the use of this technic. I do not mean to condemn the technic, for I have used it myself and I believe that good and bad drawings can be made in any medium. I simply wish to caution against permitting any technic to become more important than the drawing itself.

Another pioneer in American medical illustration was Tom Jones of Chicago. He illustrated the *Cross Section Anatomy* by Eycleshymer, Curtis' *Textbook of Gynecology* and many other works, and he also founded a school for medical illustration at the University of Illinois. Jones employs a wash or water-color technic and also works in pen and ink. A number of other schools for the teaching of medical illustration have since been started in various institutions throughout the country. The art has also been fostered through the employment of artists by various institutions and hospitals. It is unfortunate, however, that more funds are not available for this purpose today and that many of the large hospitals and even teaching institutions do not have medical artists on their staff. Medical publishers also have become highly picture-conscious, but unfortunately they do not make sufficient funds available to the artist to make it worth his while to labor in this difficult but important field.

I am often asked "How did you ever get the idea of going into the field of medical illustration instead of the actual practice of surgery?" The truth of the matter is that I never really got the idea; I fell into it, so to speak, gradually. I started out in life with every intention of being an artist and not a doctor. I studied at the National Academy of Design and at the Art Students' League and actually did considerable commercial illustration, portrait work and scenic painting; I dabbled in practically every field of art. But then I changed my mind and decided to be a doctor, truly believing that I was through with art for good. In medical school, however, I found that I could learn my subjects better by making drawings in my notebooks than by attempting to memorize the texts. As a result, my books were full of sketches. Some of my professors noted my drawings and asked me to illustrate their articles and books, and this occupied most of my spare time in medical school and during my internship. On opening my office I once more put away my art supplies, intending to devote myself exclusively to surgery. But those were the days of the depression, and there seemed to be more demand for my pictures than for my practice. The day finally came when I was so busy with pictures that it was necessary for me to make a choice between the two fields, and happily, I chose illustration. Since then I have worked on many interesting projects. One of the most arduous of these was building the "transparent woman" for the San Francisco Golden Gate Exposition. This was a transparent figure of a woman seven feet high, with a synchronized voice that told the story of the female endocrines. It depicted the menstrual process and the development and birth of a baby as well as the physical and sexual development of a woman. I labored on this project day and night for seven months. An interesting sidelight in my career was my being commissioned to paint a series of twelve incidents in the life of a physician. This consisted of a series of large paintings of such subjects as the boy sitting up the night before the osteology exam, studying away to the point of exhaustion; the emergency ward; the ambulance call; the class reunion; the country night call, etc.

During the war I was in the army, stationed first at the Army Institute of Pathology and then at the Surgeon General's Office, in charge of graphic training aids for the medical department. The army soon learned the value of pictures as time-

savers in teaching medical and semimedical subjects. Being an officer, I was not supposed to make drawings myself, which was fortunate, since many of the projects given me called for as many as a thousand or more illustrations! I would plan them, sketch them roughly and lay them out to be executed by others. We produced a number of manuals and portfolios on such subjects as first aid for combat troops, roentgenology for technicians, sanitation in the field and survival in the tropics.

After the war I devoted more and more of my effort to working under the sponsorship of the Ciba Pharmaceutical Products Co. Several years ago I began, under Ciba sponsorship, a monumental project illustrating the entire anatomic and pathologic character of the human body, system by system, and this project I expect to occupy the major part of what remains of my working career. Thus far two volumes have been published, *The Nervous System* and *The Reproductive System. The Digestive System,* because it is so voluminous, will be published in three parts: first, *The Liver, Gallbladder, Bile Ducts and Pancreas,* which is now in press; second, *The Alimentary Tract, from the Mouth through the Stomach,* and third, work covering the remainder of the alimentary tract. From there on we shall progress to the circulatory system, the endocrine system, and so forth. I do not, however, expect to follow a purely systemic approach; I shall deviate occasionally from this to a regional one. For example, I expect to do a volume on the extremities and another on the head and neck.

Now as to how I work: I cannot give a sure-fire formula for making a successful medical illustration. I believe that each artist develops his own methods and technics, but I shall try to offer a few basic principles and to tell a little how I, personally, make a drawing. First comes the study, and this is the most difficult and unquestionably the most important part of the entire undertaking. I never start a drawing until I have a thorough grasp of the subject matter. When I say a thorough grasp, I mean not just a good enough understanding to make the picture; I must understand it so well that I feel perfectly at home in the field; so well that I understand the essential points, the points to emphasize and the points to eliminate. I must know exactly what I am trying to express with this picture, what I am trying to say and what idea I am trying to transmit.

This study is done in various ways. First come talks with the consultant. For each subject we try to choose a consultant who is outstanding in the field. This may mean trips to various parts of the country, but they are worth the effort. Then I make an intensive study of the published literature. Visits to hospitals are sometimes necessary to observe clinical cases, pathologic or surgical specimens or operative procedures. Sometimes an original dissection is necessary. When I feel that I have thoroughly grasped the subject and can mentally visualize what I want to put on paper, I proceed with the sketch, trying always to keep my original mental image from becoming befuddled. I make my sketch on a tissue or tracing pad, using cheap pencils both for the sake of economy and because I find that the points stand up better than do those of the expensive ones.

Always keeping the fundamental idea of the picture in mind, I have found three basic considerations that are useful in planning a picture: first, the point of view; that is, whether the subject is to be viewed from above, the side, the rear, etc.; second, the plane; that is, the depth to which the dissection will be carried, since in some pictures two or three or four different planes of dissection may be necessary. For this reason I believe that the medical artist must be a good visu-

alizer of anatomy. Finally, there is the consideration of focus. By this I mean, the extent of the area that is to be included in the illustration. Am I to draw in the entire body, half the body, or only a small area?

Having completed the sketch, I transfer it to a piece of illustration board for the finished drawing. I do this by blacking up the back of the picture with a soft pencil, taping the tissue down on the illustration board with Scotch tape, going over the lines with a hard pencil. I have used various media for my finished illustrations over the years, but I now work almost exclusively in what is known as opaque water color, which artists call "gouash"—ordinary transparent water colors mixed with white paint. I hold no brief for this medium; I use it simply because I have found that I am at home with it and can work more rapidly than with others. In this field it is essential for the artist to feel at home with his medium; if he finds himself struggling with a medium or with the drawing, he cannot concentrate adequately on the subject matter he is trying to depict. As one works with a medium, one learns many little tricks and devices that will help to give a certain effect.

Finally, I should like to express my appreciation for the help and encouragement I have had over the years from Dr. Ernst Oppenheimer, who has edited and continues to edit the Ciba volumes on which I am now at work. Whenever I am at a loss as to where I can obtain certain information he is able to put his finger on it, and whenever I am faced with a problem of finding a good consultant on a particular subject he knows the answer. Whenever I am awed with the problem with which I am confronted, he assures me that I can overcome it. Such a friend and editor such as this is one of the most valuable assets of any medical artist.

—Frank H. Netter, M.D.
East Norwich,
Long Island, N. Y.

I would single out for praise the physician who particularly excels in the treatment of acute diseases, for these cause the greatest number of deaths. By acute diseases are meant the conditions which earlier doctors have named pleurisy, pneumonia, brain-fever and *causus*, and conditions resembling them which usually show continued fever. For in the absence of an epidemic of a disease of the plague type, many more die of these conditions than all the others together.

—*Hippocrates*

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Proctology. By Harry E. Bacon, Stuart T. Ross and Porfirio M. Recio. Philadelphia: The J. B. Lippincott Company, 1956. Pp. 441, with 228 illustrations and 5 color plates. *Reviewed in this issue.*

Principles and Methods of Sterilization. By John J. Perkins. Springfield, Ill.; Charles C Thomas, Publisher, 1956. Pp. 340, with 174 illustrations. *Reviewed in this issue.*

Clinical Laboratory Methods and Diagnosis. By R. B. H. Gradwohl. St. Louis: The C. V. Mosby Company, 1956. 5th ed. 2 vol. Pp. 2452, with 765 illustrations and 52 color plates. *Reviewed in this issue.*

Klinische Funktionsdiagnostik. By H. Kuchmeister. Stuttgart: Georg Thieme Verlag, 1956. Pp. 411, with 152 illustrations. *Reviewed in this issue.*

The Postural Complex: Observations as to Cause, Diagnosis and Treatment. By Laurence Jones. Springfield, Ill.; Charles C Thomas, Publisher, 1956.

Ulcers of the Legs. By P. Piulachs. Springfield, Ill.; Charles C Thomas, Publisher, and Oxford, England: Blackwell Scientific Publications, Ltd., and Toronto, Canada: The Ryerson Press, 1956. Pp. 573, with 303 illustrations.

The Biologic Effects of Tobacco. Edited by Ernest L. Wynder. Boston: Little, Brown & Company, 1955. Pp. 218.

The Recovery Room. By Sadove and Cross. Philadelphia: The W. B. Saunders Company, 1956. Pp. 597, with 103 illustrations.

Plastic Repair of Genito-Urinary Defects. By George Bankoff. New York: The Philosophical Library, 1956. Pp. 345, with 86 illustrations. *Reviewed in this issue.*

The Treatment of Fractures. By Lorenz Böhler. New York and London: Grune & Stratton, Inc., 1956. Vol. 2, translated from 13th German edition. Pp. 1072, with 1,721 illustrations. *Reviewed in this issue.*

Ankylosing Spondylitis: Clinical Considerations, Roentgenology, Pathologic Anatomy and Treatment. By J. Forestier, F. Jacqueline and J. Rotes-Querol. Translated by A. U. Desjardins. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 374, with 145 illustrations.

Tumors of the Skin. By Herbert Conway. Springfield, Ill. Charles C Thomas, Publisher, 1956. Pp. 267, with 178 illustrations, 3 in color.

Supplement 1, Atlas of Exfoliative Cytology. By George N. Papanicolaou. Cambridge, Mass.: Harvard University Press, 1956. Loose-leaf format, published for The Commonwealth Fund.

Handbook of Physical Therapy. By Robert Shestack. New York: Springer Publishing Company, Inc., 1956. Pp. 212.

Proctology. By Harry E. Bacon, Stuart T. Ross and Porfirio Mayo Recio. Philadelphia and Montreal: The J. B. Lippincott Company, 1956. Pp. 441, with 228 illustrations and 5 color plates.

This text, addressed primarily to the busy physician, is the work of three distinguished Fellows of the International College of Surgeons. In a sense, it follows the plan of Dr. Bacon's manual, *Essentials of Proctology*, published in 1943, although it is somewhat larger and more comprehensive in its scope. All of the problems met in connection with the diagnosis and surgical treatment of diseases of the anorectum and colon are covered. As the authors state, however, it presents fundamentals of proctology shorn of historical data, extensive description of pathology, obsolete forms of examination and treatment and bibliography. Only in this way has it been possible to offer a concise, fluent and detailed exposition of the authors' experience and current practice. It is well illustrated and quite readable. The chapters on diverticular disease, malignant tumors of the anus, rectum and colon, and intestinal parasites are of special interest, revealing as they do the best of present ideas. This volume will prove a gratifying and needed addition to the library of every physician, specialist, surgeon or general practitioner who is interested in the subject.

CURTICE ROSSER, M.D.

The Treatment of Fractures: Vol. I. By Lorenz Böhler. Translated from the Thirteenth German Edition by Hans Tretter, Helen B. Luchini, Frank Kreuz, Otto A. Russe and Robert G. B. Bjornson. New York and London: Grune and Stratton, 1956. Pp. 1072, with 1721 illustrations.

For about ten years before World War II, surgeons from various countries, including the United States and Canada, traveled to Vienna in order to study the methods of Lorenz Böhler and his assistants. Most of these surgeons returned to their home countries and reported to their colleagues that the Unfallkrankenhaus, where Prof. Böhler and his assistants taught and energetically demonstrated the care of fractures and other injuries, was the Mecca to which all surgical pilgrims should go to learn traumatology. Professor Böhler, his assistant Éhalt and other members of his staff visited Chicago, where I was privileged to meet them. I visited their hospital in Vienna shortly before the outbreak of World War II. I was impressed by the large number of severely injured patients who were being treated, both by day and by night, as outpatients or inpatients, in the Accident Hospital in Vienna.

Volume I of the fifth English edition of Böhler's reference book is the first completely new edition in English since the translation by Hey-Groves more than twenty years ago. The English translation has been accomplished by the aid of a team of able translators. Professor Böhler gives Dr. Russe credit for a large part of the translation of Volume I, and for all of the translation of Volumes II and III, which are yet to appear as part of the fifth edition in English.

Volume I is divided into two parts. Part 1 is headed *General Considerations.* It contains a classification of fractures; a second on the complications and general principles of fracture treatment of recent open wounds and recent open fractures without sulfonamides or penicillin, and a section on the treatment of long-standing infected wounds and infected fractures without sulfonamides or penicillin. Prof. Böhler explains that there is still a shortage of antibiotics in Vienna, as in many other areas in the world. In the event of war the shortage would be still more acute. For that reason he reemphasizes the methods of effective care of fractures and of infections without the aid of these antibiotics. Twenty pages are devoted to a discussion of war surgery and special army hospitals.

Part 2 is entitled *Special Parts.* This includes the treatment of fractures of the skull; dislocations of the mandible; fractures and dislocations of the spine; injuries of the chest; closed abdominal injuries caused by blunt force; open injuries to the abdomen; injuries

to the urinary system; injuries to the rectum from pelvic fractures; injuries by impalement; fractures of the pelvis; dislocations of the pelvis; fractures of the clavicle; dislocations of the clavicle; fractures of the scapula, and fractures, dislocations or other injuries of the various components of the upper extremity. The last 90 pages of Volume I describe the treatment of fractures and other injuries of the hand and fingers.

Prof. Böhler states in the foreword to the fifth English edition that he has attempted to record in Volume I his experiences as Director of the Unfallkrankenhaus, which has registered 660,000 cases of injury treated there during the period from 1925 to 1955, with approximately 87,000 inpatients. Prof. Böhler also had a wide experience in the treatment of gunshot wounds of bones and joints during both World Wars.

The general principles of treatment, as outlined, are excellent. The specific technics used for certain types of fractures, however, would not be acceptable to many experienced orthopedic surgeons. Böhler still treats many fractures of the shaft of the humerus with abduction splints or shoulder and arm spica casts. The hanging cast, which has been widely used for fractures of the shaft of the humerus, is not discussed in the section dealing with fractures of the upper extremity.

Prof. Böhler expresses disapproval of intramedullary fixation as a general principle. He states that intramedullary fixation retards the formation of callus and hence delays union or promotes nonunion. This has not been the experience of most orthopedic surgeons in the United States. The surgeon who opens the site of a fracture, either recent or old, for the insertion of an intramedullary rod, or for any other type of internal fixation, has the opportunity of stimulating callus and new bone formation by applying multiple small bone grafts. Internal fixation by means of a slotted plate or intramedullary rod makes possible early motion of adjacent joints. This use of muscles not only promotes better circulation and better tonus but helps to maintain physiologic compression between the fracture fragments.

It was a disappointment to me to find Prof. Böhler recommending circular loops of malleable wire in the treatment of fractures of the long bones. The fact that he has succeeded in obtaining union of many oblique fractures treated by this method does not make the method one that can be accepted or recommended to students. More acceptable methods of treating these fractures are available. Many technics and methods discarded by other fracture surgeons ten or fifteen years ago are recommended in this volume. Some modern and widely approved technics are completely omitted, including the work of such important contributors as Charnley and Eggers, who showed the importance of physiologic compression between fracture fragments to promote healing.

EDWARD L. COMPERE, M.D.

Principles and Methods of Sterilization. By John J. Perkins. Springfield, Ill.: Charles C Thomas, Publisher, 1956. Pp. 340, with 174 illustrations.

There has long been a need for this type of book. In hospital institutions there are many professional and nonprofessional workers upon whom the science of sterilization and surgical asepsis depends. The author of this book, who is director of research for the American Sterilizer Company, has organized and systematized the study of sterilization in this book so that it is "meaty" and not voluminous.

Regardless of the equipment and/or process of sterilization concerned, the author covers the subject in such an organized, systematic method that it can be covered, referred to and digested easily and briefly. The excerpt by Alexis Carrel in the beginning of the book covers the principles and purposes of the manuscript. An excellent chapter deals with the planning and organization of a central supply. This book will be a welcome addition to the surgeon's armamentarium and of interest to operating room supervisors, central supply offices, laboratory technicians, small and large clinic staffs, pathologists, bacteriologists, directors of nursing, hospital administrators and maintenance engineers.

JEROME J. MOSES, M.D.

Clinical Laboratory Methods and Diagnosis. By R. B. H. Gradwohl. St. Louis: The C. V. Mosby Company, 1956. 5th ed. 2 vol. Pp. 2452, with 765 illustrations and 52 color plates.

This new edition of Gradwohl's classic on laboratory technics and diagnosis is a worthy successor to the previous editions. The material is concentrated in two volumes, and every chapter has been brought up to date. All of the latest knowledge and methods are included.

Most of the chapters were, as usual, written by Dr. Gradwohl himself. The chapter on bacteriology was newly revised by Dr. Oscar Felsenfeld. The chapter on hepatic diseases has been enriched by a contribution from Dr. Spellberg. Dr. G. G. Weinstein prepared a special section on body fluids and electrolytes. The hematology chapter was supervised by Dr. Harry Agress, and the chapter on medical mycology was written by Dr. C. W. Emmons.

There is no doubt that a work written with so much care by experts in every field is an outstanding achievement. This reviewer enjoyed reading the book, which, in spite of the fact that it contains all the methods used in the laboratory, is lively and readable. Needless to say, this book should have a place in every laboratory and in the library of every pathologist.

WERNER F. EISENSTAEDT, M.D.

Tuberculosis in Obstetrics and Gynecology. By George Schaeffer. Boston: Little, Brown & Co., 1956. Pp. 307, with 58 illustrations.

This book is much needed, for it brings up to date all the monumental advances in the knowledge of tuberculosis as it is related to obstetrics and gynecology. The author has had extensive experience and clearly portrays the modern methods of treating tuberculosis of the female genitalia.

The work is extremely rich in description of the various methods of diagnosis. An excellent portion is the section dealing with the prenatal, antepartum period, labor, and postpartum care of the tuberculous pregnant patient. Although the final answer as to the diagnosis and treatment of tuberculosis of the female genitalia has not been ascertained, the author, in a very lucid manner, presents all the information now available.

The treatment and care of the tuberculous patient have changed remarkably in the past decade. The author presents the entire subject in a readable manner. The book should have inestimable value for the general practitioner as well as for the obstetrician and gynecologist. Anyone who is interested in tuberculosis will find it a real gem.

E. A. KANTER, M.D.

Klinische Funktionsdiagnostik. By H. Kuchmeister. Stuttgart: Georg Thieme Verlag, 1956. Pp. 411, with 152 illustrations.

This book represents an interesting attempt to summarize the available diagnostic means in order to observe normal or abnormal function of systems and organs. It was a difficult undertaking, requiring the knowledge of an experienced clinician and an experienced clinical pathologist. The author fulfills these conditions and reveals, in different chapters, his knowledge and experience in the field of laboratory and clinical diagnosis.

Needless to say, a book like this is subjectively written and must therefore represent mainly the author's experiences. The chapters on respiration, kidney diseases and hematology are written by the author's co-workers. They are well adapted to the general tenor of the book.

Although one might argue with the author as to the value of certain methods presented, one must admit that the book in general fulfills its purpose. It is a book in which every clinician should be interested and which an experienced clinical pathologist would like to read.

WERNER F. EISENSTAEDT, M.D.

Plastic Repair of Genito-Urinary Defects. By George Bankoff. New York: Philosophical Library, 1956. Pp. 345, with 86 illustrations.

This book provides a guide to the nature of congenital and acquired genitourinary defects and their surgical repair. The text is divided into three sections. Part 1 deals with the embryologic and anatomic aspects of the genitourinary systems. This is an excellent chapter

and gives a complete review of the subject. Part 2 deals with malformations and plastic repair of the gentiourinary system in both sexes. Throughout this chapter the author has used specially drawn illustrations, showing the stages of the various technics employed. Many of these illustrations are excellent; a few, however, are difficult to follow. Short summations of different technics for similar plastic procedures are included.

The various operations could have been described more thoroughly, but, as the author suggests, the illustrations were used to clarify the procedure and reduce the amount of description in the text.

Part 3 deals with sterility and impotence in the male and in the female and briefly reviews the cause, effect and treatment.

Surgeons, both general and specially trained in the plastic repair of genitourinary defects, will find this book valuable for reference, in that the information desired is in one concise treatise.

BERNARD E. COHLER, M.D.

Cushing's life work culminated in his two thousandth operation for a brain tumour. There, in his own handwriting, was a note upon each of the two thousand done just after the operation, with microscope sections of the tumour itself, and the most complete records of the patient's progress. They were encouraged to write to him on each anniversary of the operation, and now he had a dossier of life stories going back twenty years. He catalogued these macabre histories with the same imposing care as he had given to his books, and now, looking back over his experience, he realized that he had been very much more confident about brain operations at the end of his first two years of working upon them than he was now after a quarter of a century. Yet knowledge had been gained, and this could be passed on via the Brain Tumour Registry. It was not merely an exercise in professional vanity. Harvey Cushing loved manuscripts and rare books, but this gathering of the proofs of his own surgical skill in the two thousand cases was his true library.

It is rare to find three such talents in one man: the merely manual craftsmanship which the surgeon needs in his daily work; the human insight which enabled Cushing to produce the Osler biography; and the cool curiosity of the man who collected two thousand brain specimens all patiently annotated in his own handwriting.

Abstracts from Current Literature

Analysis of Five-Year Survival in Carcinoma of the Rectum and Rectosigmoid. Mayo, C. W., and Fly, O. A., Surg., Gynec. & Obst. 1:94, 1956.

A comparison of the survival rates for 1,146 patients with carcinoma of the rectum and rectosigmoid treated by anterior resection, by one-stage combined abdominoperineal resection or by posterior resection is presented. The influence of metastasis to the regional lymph nodes, of the grade of malignancy of the lesion, of its proctoscopic level and of its location in relation to the peritoneal reflection is analyzed, and a comparison made of the three operative procedures.

The results of these survival studies in the "controversial groups," i.e., patients whose lesions are located between 6 and 15 cm. from the dentate margin, indicate that a sphincter-preserving procedure, such as anterior resection, is as curative as is one-stage combined abdominoperineal resection or two-stage posterior resection.

The level of the lesion in relation to the peritoneal reflection has little influence on the survival rates.

WILLIAM E. NORTH, M.D.

Mass Screening Techniques for Cancer of the Cervix. Oppenheim, A.; Rosenthal, T., and Modin, M. C., J.A.M.A. 161:1067, 1956.

If early diagnosis and effective therapy of carcinoma are to be achieved, screening technics must be developed that can be applied to large groups of the population.

With these views in mind, and in an effort to parallel the self-examination program for mammary carcinoma, methods of obtaining vaginal secretions by the patient herself were developed.

The dry smear technic is utilized. The patient prepares a slide by streaking it with an application. She then separates the lips of the vagina and inserts the prepared swab gently into the vagina, rolling it from side to side several times.

This method has met with good cooperation on the part of the patient.

EDMUND LISSACK, M.D.

Results of Subtotal Gastric Resection (Billroth II Type) for Duodenal Ulcer. Roth, J. L. A.; Becker, I.; Vine, S., and Bockus, H. L., J.A.M.A. 1:794, 1956.

Correlation of postoperative with preoperative acidity and the extent of gastric resection in 100 patients on whom the Billroth II type of subtotal gastric resection was performed for duodenal ulcer has led to the following conclusions:

1. The higher the preoperative level of free acid, the greater the likelihood of increased postoperative acidity. Fifty per cent of the patients with preoperative "hyperacidity" had acid after the operation. Only 13 per cent of patients with normal preoperative acid levels showed acid after the operation.

2. The less extensive the resection, the greater the likelihood of a higher postoperative free acid titer. Sixty-four per cent of patients with hyperacidity before a resection of two-thirds of the stomach had more than 10 clinical units of free acid postoperatively, whereas only 21 per cent of the group with hyperacidity before a gastric resection of three-fourths or more had more than 10 units of hydrochloric acid postoperatively.

3. The higher the preoperative acidity, the greater the necessity for a more extensive resection to achieve a lower postoperative acid level.

4. The higher the postoperative acidity, the greater the likelihood that anastomotic ulcer will develop. Anastomotic ulcer occurred in 4 of 30 patients who had undergone the less extensive resections and in none of the 70 patients who were treated by resection of at

least three-fourths resection of the stomach.

The lowest free acid titer associated with recurrent ulcer was 10 clinical units.

Thus, the surgeon can often predict the chances of discovering free acid postoperatively and may surmise which patients are most likely to have an excess of free acid after routine subtotal gastrectomy. He might then consider a more extensive resection, with complementary vagotomy.

The conventional subtotal gastrectomy gives satisfactory results in 85 to 90 per cent of patients who require operation for duodenal ulcer. In the 10 to 15 per cent of patients in whom the results are not satisfactory because of persistent severe dumping symptoms and/or profound loss of weight, future experience with other operative procedures may justify their selection on an individualized basis. Thus, a 50 per cent gastrectomy (hemigastrectomy) or gastroenterostomy with a complementary vagotomy may be preferred for the patient susceptible to the dumping sensations by virtue of nervous temperament; or a Billroth I anastomosis with three-fourths gastrectomy (or hemigastrectomy and vagotomy) may be selected for the patient who has always had difficulty in maintaining normal weight. Regardless of the foregoing considerations, however, the surgical anatomic condition and the state of the ulcer may dictate the type of operation to be performed.

WILLIAM E. NORTH, M.D.

Can Mass X-Ray Survey be Used in Detection of Early Cancer of the Breast? Gershon-Cohen, J.; Ingleby, H., and Moore, L., J.A.M.A. 161:1069, 1956.

Therapeutic measures for carcinoma of the breast have been largely contingent upon recognition of clinically established tumors.

Biopsy of mammary lesions should be done promptly when indicated. Roentgen examination can help to elucidate the indications. When a carcinoma cannot be detected because of its small size or because it is crushed by a clinically nodular breast, roentgen films can be of the greatest assistance.

Tumors not clinically obvious may be too small for palpation or may be mashed by concomitant benign aplasia. Most small carcinomas have the same roentgen appearance as do larger growths. In areas where malignant change is suspected, an area of punctuate cocification or an ill-defined shadow with no corresponding shadow in the contralateral breast may alert the roentgenologist.

In clinically lumpy breasts, the diagnostic problem lies in differentiation between benign tumor and possible carcinoma. The nature of many of these neoplasms will be obvious on the roentgen film. The irregular infiltrating margins of a carcinoma contrast with the well-defined opacity of a cyst or an adenofibroma. In case of suspicion, serial reexamination will usually differentiate stationary tumors from areas of active hyperplasia.

EDMUND LISSACK, M.D.

A New Operation for Construction of an Artificial Fallopian Tube. Gross, B. G., and Erskine, C. A., Lancet 1:777, 1956.

The author describes a total plastic reconstruction of the uterine tube from local peritoneal tissue.

The operation consists of oversewing the round ligament with broad ligament peritoneum over a shaper of polyethylene cord. A new interstitial section and uterine ostium are reamed and lined by metrial peritoneum.

Where less extensive reconstruction is required, the same principle is applied by a simple modification of the technic.

EDMUND LISSACK, M.D.

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ileostomy
and
colostomy

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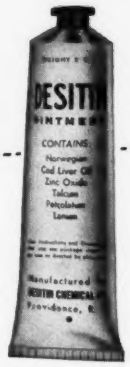

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